Academic Achievement of Legally Blind Students

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Abstract

This study was conducted for two purposes. The primary objective was to determine if legally blind students in grades 2-6 were performing academically at grade level as measured by the Stanford Achievement Test, Form A or B. The second objective was to determine specific concept areas in mathematics where deficiencies exist. These objectives were accomplished by gathering data on Stanford Achievement Tests that had already been administered. Data were collected on 369 legally blind students from residential and public schools, braille and large type readers. The grade deviations on all three math subtests, for both braille and large type readers, were in the minus direction. The scores were also quite poor and all in the minus direction for social science and science. On three subtests, the braille readers generally scored better than the large type readers. These subtests were Vocabulary, Word Study Skills, and Spelling. The three subtests on which the scores were generally the best overall were Reading Comprehension, Listening Comprehension, and Language. Two hundred twenty-four of the 369 students' data were used to determine math deficiencies. The braille readers had pervasive problems. The poorest performance for braille readers was on mathematics concepts. The large type users had no major problems, although mathematics applications seemed to pose much more of a problem than did the area of concepts or computation.

Academic Achievement of Legally Blind Students

Introduction

Children with visual disabilities are those who differ from the average to such a degree that special personnel, curriculum adaptation, and/or additional instructional materials are needed to assist them in achieving at a level commensurate with their abilities (Harley, 1973). The educational achievement of visually handicapped children in special education programs has generally shown some academic retardation. Evidence of retardation has been indicated in studies of both large type and braille readers using achievement test and age-grade comparisons with normally seeing children (Harley, 1973).

Blind students are generally thought to be functioning academically behind their sighted peers. But only a limited amount of research has been done in which academic areas need the most attention. Additionally, one might wonder whether appropriate instructional materials in the academic areas which pose special problems for the blind would increase their knowledge in these areas and thereby improve blind students' standardized test scores.

Zweibelson and Barg (1967) found visually handicapped students inferior to sighted students in abstract concepts. Because of the abstract nature of mathematics, it is generally true that this particular area presents some special problems for blind students. At a needs meeting in mathematics held at the American Printing House for the Blind in 1979, ten expert teachers of visually handicapped identified the development of entry level, primary grade math materials, designed to introduce/illustrate/teach concretely basic math operations and concepts to blind students, as their highest priority need. A need for an item analysis of the mathematics tests of the Stanford Achievement Test was also expressed.

A study by Nolan and Ashcroft (1959) indicated generally low arithmetic achievement of braille students. They concluded that 75% of the students were below grade level and that, on the average, they scored 15% below the norm. Then, Nolan and Bruce (1962) found that blind children in the primary grades could approximate or exceed the arithmetic achievement norms for sighted children after participating in an experimental curriculum. Ten years later, Brothers (1972) conducted a study which focused on the computational skills of visually handicapped students in public schools. He found that achievement in this area was generally below expected grade levels by 2-9 months. There were no significant differences found between the scores of braille and large type students.

Coker (1979) conducted a study in which he compared the self-concepts and academic achievement of visually handicapped children enrolled in regular day schools and in residential schools. Eleven subtests of the Stanford Achievement Test were used for comparison. He found that the mean scores for visually handicapped children at the third grade are at grade level but as students pass on to the next grades, scores progressively decrease and by the sixth grade they are slightly below grade level.

For the total sample, visually handicapped students were above or equal to grade level in tests of vocabulary, reading comprehension, word study skills, mathematics applications, language, science, and listening comprehension. The total sample was below grade level in mathematical concepts, mathematical computation, social science, and spelling. Skills such as vocabulary, reading, language, and listening comprehension seem to remain equal to or better than grade level throughout the grades. However, all other skills show a decrease from the third grade.

Hayes (1941) gave data for 600 children in grades 4-9 which showed blind children to achieve within sighted norms on every subtest except arithmetic computation, where they scored approximately 20% below the sighted norms for each grade. However, he pointed out that the visually impaired child is at least 2 years older than sighted children in the same grade.

Bateman (1963) found that the reading-achievement scores of partially seeing students from grades 3 and 4 are less than one-half month below grade placement according to the norms. However, when these scores were compared with mental ages, reading achievement was 5.2 months below mental age for third graders and 6.5 months below for the fourth graders.

Birch and others (1966), in a study involving 903 partially seeing students in grades 5 and 6, reported that these children were over age in grade placement by 1 year and 9 months, and that they were academically retarded by 1 year and 11 months.

Statement of the Problem

The purpose of this study was twofold. The primary objective was to determine if legally blind students in grades 2-6 were performing academically at grade level as measured by the Stanford Achievement Test, Form A or B. The second objective was to determine specific concept areas in mathematics where deficiencies exist.

Hypotheses

It was suspected that legally blind students were functioning academically lower than their sighted peers and that they were older than their sighted peers in similar grade levels.

It was hoped that this study would provide more information to the problem stated above by gathering data on as many legally blind students as possible.

Method

Subjects

Criteria for inclusion in study:

1. Each subject was classified as legally blind according to ophthalmological reports contained in school records.
2. Subjects were enrolled in standard academic curriculums.
3. Subjects were not administered the test orally.

General subject requirements:

1. At least 50 subjects in each of four levels of the Stanford Achievement Test.
2. Subjects were drawn from both residential and public schools.
3. Large type, regular print, and braille readers were included.

Subject variables not controlled:

1. How long subject had been blind.
2. How long subject had been reading braille.
3. How long subject may have been in same grade.
4. How grade placement had been decided.

Materials

The instrument utilized in this study was the Stanford Achievement Test in regular print, large type, and braille, Form A or B, Primary Battery Levels II (grades 2.5-3.4) and III (grades 3.5-4.4); and Intermediate Battery Levels I (grades 4.5-5.4) and II (grades 5.5-6.9), as adapted by the American Printing House for the Blind.

Test variables not controlled:

1. Which level of test had been administered.
2. Whether all subtests had been administered to all students.

Procedure

The primary task was to gather data on Stanford Achievement Tests that had already been administered. In order to accomplish the first objective as specified under "Statement of the Problem," schools where the four levels of the Stanford Achievement Test under investigation had been shipped during the past 3 years were contacted. This was accomplished through the use of the IBM Department and Business Office at the American Printing House for the Blind. The IBM Department had a list of the "ship-to" individuals, agencies, schools, school systems, institutions, or cities and states that had ordered large type or braille copies of the Stanford Achievement Test. For more complete shipping information, the records in the Business Office were used. The study was carried out on those having purchased the test from January, 1977 through approximately September, 1979.

In order to accomplish the first objective, it was necessary to have either the raw score or grade equivalent scored by each student on each subtest. In order to accomplish the second objective, it was necessary to have the response records of the students on the three math subtests. An item analysis was to be done to identify the concepts and operations in mathematics where visually handicapped students were having problems.

A letter explaining the project and information needed and a questionnaire regarding the availability of data and their willingness to share these data with the American Printing House for the Blind were sent to the vision program coordinators. [See Appendix A.]

The Editorial Department then supplied the names and addresses of trustees or field people who did the ordering of materials for a particular state or area. [See Appendix B for a listing of these people.] Another letter was sent to these people. [See Appendix C for a copy of this letter.] They either provided the names and addresses of teachers and others who had placed orders for the Stanford Achievement Test through them or they requested a number of questionnaires that they sent directly to the teachers themselves.

Forms were drafted in order to record the necessary information from the Stanford Achievement Test results. [See Appendix D for a copy of the forms.] The information needed in order to accomplish the objectives of the project included reporting the raw score and/or grade equivalent on each subtest of the Stanford Achievement Test and identifying the questions incorrectly answered on the three math sections. The forms were piloted at the Govenor Morehead School in North Carolina.

After pilot testing the forms to determine whether or not they were comprehensive and whether or not adequate data were being gathered, 210 letters and questionnaires were sent to vision program coordinators and 21 letters to trustees or field people who did ordering of materials.

Approximately 128 various replies were received as a result of the request for information or student data. These included regrets for not having the data anymore, the students not meeting the criteria, relating the specific number and level of forms needed, or actual Stanford Achievement Test raw scores and/or grade equivalents that had to be put on the forms at the American Printing House for the Blind and the scores returned to the sender.

As a result of the replies, data on 385 students were received. However, 16 students' data were not included in the study. The reasons for not including these data were varied. Some of the forms had essential information missing, some had ambiguous information, some reported information from other than Form A or B, two students had been given the test orally, some data from levels other than the four under study were reported, and a few forms were received too late to be used. The calculations were based on the data of 369 students except where indicated. The data used represented scores from approximately 35 schools or school systems.

Results

Tables 1-5 and Graph 1 relate only student information.

Table 1 gives a breakdown of the approximate number of students in residential or public school systems taking one of the four levels of the Stanford Achievement Test. The information is an approximation only since the questionnaire did not request the person to indicate in which type of program the student was enrolled. However, from the return addresses, the programs were categorized under one of the two headings indicated.

The data are weighed heavily on the side of residential student results. To be truly representative of the legally blind population registered in the grades under investigation, the data should have been reversed (i.e., approximately three to one, with more results coming from public schools instead of approximately three to one with more data gathered on residential school students).

Insert Table 1 about here

Table 2 shows the exact number of students included in the sample population taking one of each of the four levels of the Stanford Achievement Test in regular print, large type, or in braille. Since only three students took the test in regular print, these students' data were included with the large type readers.

There were nearly twice as many large type readers than braille readers included in the study. This is a fairly good representation of the population since the ratio of large type readers to braille readers registered at the American Printing House for the Blind is approximately two to one.

Insert Table 2 about here

Table 3 shows the number and percentage of students who were above, below, or within the prescribed grade range on the four levels of the Stanford Achievement Test under study and the range of grades above or below on each level. The data are broken down into large type and braille categories. The prescribed grade range refers to the grade range stated on the Stanford Achievement Test itself (i.e., Primary Battery Level II has been set up to test the achievement level of students in grades 2.4-3.4, Primary Battery Level III to test students in grades 3.5-4.4, Primary Battery Level III to test students in grades 4.5-5.4, and Intermediate Battery Level II to test students in grades 5.5-6.9). A table for "The Grade Placement at Time of Testing" can be found in the Stanford Achievement Test Norms Booklet, page 12 (see Madden references). For example, 2.5 would indicate that the student is in the second grade and the date of testing was between January 16-February 15, inclusive, or that the student had had 19-22 weeks of instruction in the second grade.

Overall, 59% of the students who were administered a certain level of the Stanford Achievement Test were within the grade ranges recommended for that particular level of the test, and 26% of the students were in grades beyond the prescribed grade range for taking a particular level of the Stanford Achievement Test. The range beyond the prescribed grade range was from .1 of a grade beyond to as much as 7.4 grades beyond the prescribed grade range, with a mean maximum of 3.1 grades beyond the prescribed grade range. While 15% of the students were in grades below the prescribed grade range, the range was only from .1 of a grade below the prescribed grade range to a maximum of 1.6 grades below the prescribed grade range, with a mean maximum of .7 of a grade lower than the prescribed grade range.

Many students were administered inappropriate levels of the Stanford Achievement Test and a majority of these students were in more advanced grades than a particular level of the Stanford Achievement Test recommended. While there are overlapping norms which allow plotting and reading continuous grade equivalent lines across all levels of the Stanford Achievement Test, it is highly advisable to administer the appropriate level in order that the scoring will accurately reflect the achievement levels of students taking the test. It could be questioned in this study whether the scores of these students were somewhat inflated since more than one-fourth of them were, on the average, over three grades beyond the prescribed grade range recommended for taking a particular level of the test.

Insert Table 3 about here

Table 4 shows the number and percentage of students who were older, younger, or the appropriate age for their assigned grade and the range of years older or younger. Age range has been calculated in whole years.

The assumption made in this table is that the appropriate age in the first grade is 6, second grade is 7, third grade is 8, fourth grade is 9, fifth grade is 10, sixth grade is 11, seventh grade is 12, eighth grade is 13, ninth grade is 14, tenth grade is 15, and eleventh grade is 16.

One can immediately see from the table that a large majority of the students were older than one would expect a typical student in a particular grade to be. The percentage of students, across the four levels of the Stanford Achievement Test under examination, who were older than usual for their assigned grade ranged from 62% to 95%. This percentage is exaggerated though because of the method of calculating the age deviation as described in the previous paragraph. Taking the students who fell only 1 year older than the appropriate age for their assigned grade and placing them in the category of "Number of subjects appropriate age," the percentage of students older than the norm decreases to a range of 23% to 52%. This is still high, however, and indicates that one-fourth to one-half the students taking one of the four levels of the Stanford Achievement Test were older than normal for their assigned grade. The percentage of students who were younger than usual for their assigned grade ranged from 0% to 7%. The remaining students were appropriate ages for their assigned grades.

Insert Table 4 about here

Table 5 shows the mean age deviations (in years) of students taking one of the four levels of the Stanford Achievement Test in large type or braille. At all levels, the students are over 1 year older than the norm for their assigned grade levels. The age deviation is actually closer to 1 1/2 years. The table also indicates that the age deviation tends to increase as the students progress through the grades.

Insert Table 5 about here

Graph 1

Graph 1 shows the mean overall grade and mean overall age of the legally blind students who were included in this study. To arrive at these means, all the students who were in the same assigned grade, regardless of which level of the Stanford Achievement Test they were administered, were combined and their ages in years and months were tallied. The grade and age at time of testing were added for the students in the same assigned grade and divided by the appropriate n.

The graph has been marked off with dashed vertical lines at grades 2 and 7. The number of students in grades 1 and 7-11 was too few to have a representative sample. The graph shows that in these grades the legally blind students were more than 1 year older in all grades than their sighted peers. Also, braille readers tended to be a little older than print readers in the same grade.

Insert Graph 1 about here

Table 6 relates the results of the subtests on the Stanford Achievement Test. It shows the mean grade deviations for large type and braille readers on four levels of the Stanford Achievement Test. Grade deviation has been defined as the difference between the grade equivalent scored on a particular subtest and the actual assigned grade of the student. A grade deviation in the minus direction indicates that the students who took that subtest scored below their actual grade placement while a plus indicates that the students, on the average, scored above their grade placement.

The grade deviations on all three math subtests, for both braille and large type readers, were in the minus direction. And, in all but three instances, the braille readers scored much more poorly than the large type readers.

The scores were also quite poor and all in the minus direction for social science and science. These scores were not available for braille readers who had taken Primary Battery Level II since these subtests were omitted at this level.

The three subtests on which the scores were generally the best overall, as indicated by scores in the plus direction, were Reading Comprehension, Listening Comprehension, and Language. This was only true for the two upper levels, Intermediate Battery I and Intermediate Battery Level II.

Insert Table 6 about here

The second objective was to determine specific concept areas in mathematics where deficiencies exist. This objective was accomplished by an item analysis on the three math subtests of the Stanford Achievement Test, Form A or B, where all the individual item responses were still available. The individual item responses were available for 224 of the 369 students.

Tables 7-14 give the results obtained on each question of the three subtests in relation to the norm. The braille items have been numbered to match the print edition. The scores were calculated by finding the percentage of students answering the item correctly minus the item difficulty value (percentage of pupils on whom the test was normed answering each item correctly) which then equalled the difference score. Item difficulty values can be found in each Norms Booklet, Table 11 (see Madden references). Two or three item difficulty values are given for each item. For example, there may be an item difficulty value for the end of grade 2 and one for the beginning of grade 3, or there may be separate item difficulty values for the middle of grade 2, end of grade 2, and beginning of grade 3. However, the math scores were not from students who had taken the test at the same time of year or in the same grade. Since the reported scores came from various grade levels, either the two item difficulty values were averaged and the average was used in the calculations, or in the case of three item difficulty values, the middle score was used for calculating the difference score.

If the difference score was a plus score, then the legally blind students had performed better than the norm on that particular item. If the score was in the minus direction, then the legally blind students had performed more poorly than the national group on whom the test was normed. Those items preceded by an asterisk (*) indicate difference scores which were -25% or more.

Insert Tables 7-14 about here

Table 15 shows the number of items on each subtest, at each level. Also, the standard errors of measurement are shown. The item totals and standard errors of measurement in parentheses indicate braille totals and standard errors of measurement which differ from the regular type or large type statistics.

Insert Table 15 about here

Table 16 shows the proportion of extremely difficult items for each level of the Stanford Achievement Test on each of the three math subtests for braille and large type. An item was considered extremely difficult if the percentage of legally blind students answering the item correctly minus the item difficulty value (see explanation from Tables 7-14 for definition of item difficulty value and how it was determined) equalled -25% or more.

The -25% difference score was selected somewhat arbitrarily in determining which items would be considered extremely difficult and therefore posing special problems for blind students. As one can see from Table 15, the standard errors of measurement across all the levels of the Stanford Achievement Test for both forms ranged from 2.0 to 2.9. Because of the small _n_, particularly for the braille readers, it was decided to select a large enough difference score so that only true problem items would be pinpointed for further examination. It was decided that a difference score of -25% would allow little or no room for chance fluctuations in the test scores.

The braille readers had pervasive problems. Their performance was much poorer than large type users. The poorest performance for braille readers was on mathematics concepts with 27% of the items in the extremely difficult category. The overall performance on computation and applications was the same; 19% of the items were extremely difficult.

There are two large type breakdowns. In the first large type table all the students who had taken Primary Battery Level II were included. However, in the second large type table, those students who had taken Primary Battery Level II, Form B, were deleted as atypical. There were probably two or more poor students in the small sample, _n_ = 7, which would drastically skew the results.

The large type users had no major problems. Although mathematics applications seemed to pose much more of a problem for these students than did the areas of concepts of computation.

Insert Table 16 about here

Tables 17-28 show the breakdown of the math subtests into item groupings. The items that test some aspect of a particular item grouping are listed by item number for each of Form A and Form B. The difficult items (as defined in Table 16) are listed for both large type and braille users who took either form of the test. These items will be reviewed and categorized as to specific concepts tested. Those concepts posing particular problems for blind students will be incorporated into the math series presently under development at the American Printing House for the Blind. According to the _Teacher's Guide for Interpreting_, all the item groupings represent suggested classifications only and may be reorganized to fit different instructional programs. The following definitions of each of the item groups were taken directly from the _Teacher's Guide for Interpreting_ (see Madden references). In addition to the definitions of the groups, in this manual there are specific suggestions for teaching the various major concepts. These ideas should also be reviewed and possibly used as suggestions for the new math series.

Primary Battery Level II

The instructional objectives for this Mathematics Applications test are grouped as follows:

1. Solution of a One-Step Problem: The pupil selects the appropriate operation to solve a one-step problem.
2. Analysis and Development of a Solution Design: The pupil solves two-step problems, rate problems, or selects a solution sentence.
3. Measurement and Graphs: The pupil demonstrates an ability to use measures of time, distance, capacity, and money values or solves problems involving a graph, tabulations, or a price display.

Table 17 shows how the individual items of Forms A and B of the Mathematics Applications test have been classified according to the three major item groupings described above.

Insert Table 17 about here

The instructional objectives for this Mathematics Computation test are grouped as follows:

1. Knowledge of Primary Facts: The pupil demonstrates knowledge of the elementary addition and subtraction facts and solves simple mathematical sentences.
2. Addition Algorithms: The pupil solves addition algorithms.
3. Subtraction Algorithms: The pupil solves subtraction algorithms.

Table 18 shows how the individual items of Forms A and B of the Mathematics Computation test have been classified according to the three objectives described above.

Insert Table 18 about here

The instructional objectives for this Mathematics Concepts test are grouped as follows:

1. Number: The pupil demonstrates the ability to count in an ordered sequence; compare values indicated by number names; complete number series; identify odd and even numbers; and recognize pictorial representations of fractional numbers.
2. Notation: The pupil reads numerals; identifies numbers represented by a simple place-value technique; interprets expanded notation; and relates alphabetic words to Arabic numerals.

3. Operations: The pupil demonstrates facility with the operation of addition and its inverse--subtraction; the properties of operation; and the additive identity of zero.
4. Geometry, Measurement, and Graphs: The pupil works with points, lines, and planes, and figures made from them; deals with set notation; makes comparisons in measurement; demonstrates the ability to think logically; and reads simple graphs.

Table 19 shows how the individual items of Forms A and B of the Mathematics Concepts test have been classified according to the four major objectives described above.

Insert Table 19 about here

Primary Battery Level III

The instructional objectives for this Mathematics Applications test are grouped as follows:

1. Solution of a One-Step Problem: The pupil solves a one-step problem by selecting the appropriate operation.
2. Analysis and Development of a Solution Design: The pupil demonstrates the ability to solve two-step problems and rate problems, and to determine what data is essential to solving a problem.
3. Measurement and Graphs: The pupil interprets tally charts both horizontally and vertically, converts inches to feet and feet to yards, and determines comparative and total costs from a price display.

Table 20 shows how the individual items of Forms A and B of the Mathematics Applications test have been classified according to the three major objectives described above.

Insert Table 20 about here

The instructional objectives for this Mathematics Computation test are grouped as follows:

1. Knowledge of Primary Facts: The pupil demonstrates knowledge of the elementary addition, subtraction, multiplication, and division facts and solves simple mathematical sentences.
2. Addition and Subtraction Algorithms: The pupil solves addition or subtraction algorithms.
3. Multiplication and Division Algorithms: The pupil solves multiplication or division algorithms.

Table 21 shows how the individual items of Forms A and B of the Mathematics Computation test have been classified according to the three major objectives described above.

Insert Table 21 about here

The instructional objectives for this Mathematics Concepts test have been classified into the following four item groupings:

1. Number: The pupil deals with the concept of betweenness; completes number series; identifies sets of odd or even numbers; determines which whole number or fraction is represented on a number line; displays an elementary knowledge of the concept of fractions; and demonstrates a view of the clock as a repeating circle, which is finite in nature.
2. Notation: The pupil demonstrates knowledge of the concepts of the Hindu-Arabic place-value system by transforming simple numerals into expanded notation; representing Arabic numerals in different forms, such as alphabetically or in Roman numerals; and identifying the place value of a digit.
3. Operations: The pupil demonstrates familiarity with the role of the additive identity of zero, the relations of inverses, the commutative and associative properties of addition, and the signs and verbal forms of operational expressions.
4. Geometry and Measurement: The pupil identifies elementary geometrical concepts such as interior regions, angles, etc., and makes comparisons and estimations in measurement.

Table 22 shows how the individual items of Forms A and B of the Mathematics Concepts test have been classified according to the four major objectives described above.

Insert Table 22 about here

Intermediate Battery Level I

The instructional objectives for this Mathematics Applications test are grouped as follows:

1. Solution of a One-Step Problem: The pupil solves a one-step problem by selecting the appropriate operation.
2. Analysis and Development of a Solution Design: The pupil demonstrates ability to solve two-step problems; to determine what data is essential to solving a problem; to make estimations; or to select the solution sentence which describes a problem.
3. Rate and Scale Problems: The pupil solves rate and scale problems.
4. Measurement: The pupil demonstrates a knowledge of the standard units of measurement and converts from one unit to another unit, such as feet to yards.
5. Graph Reading and Interpretation: The pupil reads and interprets graphs and price displays.

Table 23 shows how the individual items of Forms A and B of the Mathematics Applications test have been classified according to the five major objectives described above.

Insert Table 23 about here

The instructional objectives for this Mathematics Computation test are grouped as follows:

1. Knowledge of Primary Facts: The pupil demonstrates an understanding of the four sets of fundamental facts and solves simple mathematical sentences.
2. Addition and Subtraction Algorithms: The pupil solves multiplication or division algorithms.
3. Multiplication and Division Algorithms: The pupil solves multiplication or division algorithms.

Table 24 shows how the individual items of Forms A and B of the Mathematics Computation test have been classified according to the three major objectives described above.

Insert Table 24 about here

The instructional objectives for this Mathematics Concepts test are grouped as follows:

1. Number: The pupil demonstrates facility with the more complex number relations, sets of odd and even numbers, ordinals, identification of fractional parts, the relation of the denominator to the value of a fraction, the clock as a finite number system, and the graphing of a set of numbers.
2. Notation: The pupil identifies numbers represented on place-value devices; interprets values in Roman numeral notation; reads values expressed in expanded notation; reads numerals

that represent numbers in the thousands; translates expanded notation expressed in powers of ten into simpler terms; relates Arabic numerals of greater value to alphabetic words; and assesses the value change in a numeral with the change of a digit.

3. Operations: The pupil interprets an array as the product of two factors; simplifies a number sentence with an operation within parentheses; recognizes the associative property of addition; solves a number sentence which involves both addition and multiplication symbols; identifies terms of an algorithm; identifies the multiplicative inverse in a mathematical expression; and recognizes subtraction as an expression of set separation.
4. Geometry and Measurement: The pupil recognizes geometric relationships such as similarity, size relations, and parallelism; relates lines on a geoboard to identify a figure; identifies the statistical concept of the middle score or the middle sized; estimates length; finds the functional relation of sets of ordered pairs such as (2,4), (3,6), (4,8); and identifies the terms of set notation.

Table 25 shows how the individual items of Forms A and B of the Mathematics Concepts test have been classified according to the four major objectives described above.

Insert Table 25 about here

Intermediate Battery Level II

The instructional objectives for this Mathematics Applications test are grouped as follows:

1. Selection of an Appropriate Operation: The pupil solves a problem by selecting the most efficient operation.
2. Analysis and Development of a Solution Design: The pupil demonstrates ability to solve two-step problems; to determine what data is essential to solving a problem; to make estimations; or to select the solution sentence which describes a problem.
3. Rate and Scale Problems: The pupil solves rate and scale problems.
4. Measurement: The pupil demonstrates a knowledge of standard units of measurement; converts from one unit to another; and thinks quantitatively.
5. Graph Reading and Interpretation: The pupil reads and interprets graphs.

Table 26 shows how the individual items of Forms A and B of the Mathematics Applications test have been classified according to the five major objectives described above.

Insert Table 26 about here

The instructional objectives for the Mathematics Computation test are grouped as follows:

1. Knowledge of Primary Facts and Solution of Simple Mathematical Sentences: The pupil demonstrates an understanding of the elementary addition and subtraction facts and solves simple mathematical sentences.
2. Addition and Subtraction Algorithms: The pupil solves addition or subtraction algorithms.
3. Multiplication and Division Algorithms: The pupil demonstrates an ability to solve multiplication or division algorithms.
4. Common Fractions: The pupil solves problems involving common fractions, using any of the four fundamental operations and renaming denominators where necessary.

Table 27 shows how the individual items of Forms A and B of the Mathematics Computation test have been classified according to the four major objectives described above.

Insert Table 27 about here

The instructional objectives for this Mathematics Concepts test are grouped as follows:

1. Number: The pupil demonstrates knowledge of integers, fractional numbers, prime numbers, "betweenness," graphs of a set of numbers, and a finite module (the clock).

2. Notation: The pupil is able to work with some advanced concepts of notation such as, place values into thousands, periods in Arabic numerals, expanded notation, reading numbers in the millions, renaming an exponential numeral, rounding, and estimating after rounding.
3. Operations: The pupil demonstrates competence with concepts such as the associative property, n as a placeholder in a sentence, the multiplicative identity, equivalence of fractions, order of operations governed by parentheses, and the relation of factors to their product.
4. Geometry, Measurement, Set Notation, Ratio, Function, Logical Thinking, and Concepts Not Directly Involving Number: The pupil shows advanced understanding of geometric figures, geometric terminology, simple set terms, equivalent sets, zero as a value for the empty set, measurement of a region by square units, identification of a metric unit of measure, and the graphic relationship of a part to the whole, and finds the functional relation of sets of ordered pairs, such as (4,6) and (7,9).

Table 28 shows how the items of Forms A and B of the Mathematics Concepts test have been classified according to the four major objectives just described.

Insert Table 28 about here

Conclusions

The findings in this study led to the following general conclusions:

1. Legally blind students function academically lower than their sighted peers.
2. Legally blind students are older than their sighted peers in similar grade levels.

With regard to the specific concept areas in mathematics where deficiencies exist, the extremely difficult items are identified in Tables 17-28. It was not the intent of this paper to go into depth on the exact nature of the math deficiencies, but merely to pinpoint where the problems are, as indicated by this study, so that these concepts could be incorporated into the math series under development at the American Printing House.

Because this study was not conducted on a sample that truly represents legally blind students, no further conclusions will be drawn. However, the picture is fairly bleak. From all appearances, legally blind students are not functioning academically where they should be. A clear and accurate picture needs to be drawn. This could be accomplished by undertaking a national study of academic achievement of legally blind students.

Patterns (Caton, Pester, & Bradley, 1982), the braille reading series, might increase the reading comprehension of blind students and FOCUS (Franks & Albrecht, 1983), the math series under development, might increase the ability of blind students to better comprehend the somewhat abstract area of mathematics. However, these are only a start. More materials can be developed once the problems have been identified.

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Table 1

Approximate Number of Students in Residential or Public School Systems[1] Taking One of the Four Levels of The Stanford Achievement Test

	Residential	Public
Primary Battery Level II	61 (73%)	23 (27%)
Primary Battery Level III	80 (78%)	23 (22%)
Intermediate Battery Level I	51 (76%)	16 (24%)
Intermediate Battery Level II	88 (77%)	27 (23%)
Total	280 (76%)	89 (24%)

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[1] This information was not requested on the survey forms. However, the schools supplying the student data were categorized under one of the two headings listed.

Table 2

Number of Students Taking One of the Four Levels of The Stanford Achievement Test in Large Type or Braille

	LT	BR
Primary Battery Level II	60 (71%)	24 (29%)
Primary Battery Level III[1]	74 (72%)	29 (28%)
Intermediate Battery Level I[1]	43 (62%)	26 (38%)
Intermediate Battery Level II[1]	64 (57%)	49 (43%)
Total # of Ss:	241 (65%)	128 (35%)

[1] One student in each of these three levels was administered the test in regular print. These three subjects' data have been incorporated with the large type data in this table and all other tables or graphs.

Table 3

Number of Students Who Were Above, Below, or Within the Prescribed Grade Range and the Range of Grades Above or Below for Each of the Four Levels of The Stanford Achievement Test

Primary Battery Level II (2.5-3.4)[1]

Large Type (n = 60)

30 (50%) of tests administered to students assigned to grades 2.5-3.4

15 (25%) of tests administered to students assigned to grades below 2.5 (range 1.1-2.4)

15 (25%) of tests administered to students assigned to grades above 3.4 (range 3.5-4.8)

Braille (n = 24)

8 (33%) of tests administered to students assigned to grades 2.5-3.4

9 (38%) of tests administered to students assigned to grades below 2.5 (range 1.1-2.2)

7 (29%) of tests administered to students assigned to grades above 3.4 (range 3.5-5.7)

Primary Battery Level III (3.5-4.4)[1]

Large Type (n = 74)

32 (43%) of tests administered to students assigned to grades 3.5-4.4

13 (18%) of tests administered to students assigned to grades below 3.5 (range 1.9-3.4)

29 (39%) of tests administered to students assigned to grades above 4.4 (range 4.5-11.8)

Table 3 (continued)

Braille (n = 29)

- 14 (48%) of tests administered to students assigned to grades 3.5-4.4
- 4 (14%) of tests administered to students assigned to grades below 3.5 (grade 3.1 only)
- 11 (38%) of tests administered to students assigned to grades above 4.4 (range 4.5-5.2)

Intermediate Battery Level I (4.5-5.4)[1]

Large Type (n = 43)

- 23 (53%) of tests administered to students assigned to grades 4.5-5.4
- 3 (7%) of tests administered to students assigned to grades below 4.5 (grade 4.4 only)
- 17 (40%) of tests administered to students assigned to grades above 5.4 (range 5.5-7.9)

Braille (n = 26)

- 21 (81%) of tests administered to students assigned to grades 4.5-5.4
- 5 (19%) of tests administered to students assigned to grades above 5.4 (range 5.7-6.9)

Intermediate Battery Level II (5.5-6.9)[1]

Large Type (n = 64)

- 50 (78%) of tests administered to students assigned to grades 5.5-6.9
- 9 (14%) of tests administered to students assigned to grades below 5.5 (range 5.1-5.4)
- 5 (8%) of tests administered to students assigned to grades above 6.9 (range 7.1-11.8)

Table 3 (continued)

Braille (n = 49)

40 (82%) of tests administered to students assigned to grades 5.5-6.9

2 (4%) of tests administered to students assigned to grades below 5.5 (grade 5.1 only)

7 (14%) of tests administered to students assigned to grades above 6.9 (range 7.6-10.6)

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[1] These are the prescribed grade ranges for the four levels of the Stanford Achievement Test being examined.

Table 4

Number of Students Who Were Older, Younger, or the Appropriate Age for Their Assigned Grade and the Range of Years Older or Younger (in Whole Years)

		Number of subjects older	range	Number of subjects older by 1 year	Number of subjects younger	range	Number of subjects appropriate age
Primary Battery	LT	37 (62%)	+1-8	23	4 (7%)	-1 only	19 (32%)
Level II	BR	19 (79%)	+1-6	9	0	-	5 (21%)
Primary Battery	LT	51 (69%)	+1-4	24	3 (4%)	-1 only	20 (27%)
Level III	BR	25 (86%)	+1-5	12	0	-	4 (14%)
Intermediate Battery	LT	41 (95%)	+1-7	21	1 (2%)	-1	1 (2%)
Level I	BR	18 (69%)	+1-5	5	0	-	8 (31%)
Intermediate Battery	LT	50 (78%)	+1-5	17	3 (5%)	-1 only	11 (17%)
Level II	BR	40 (82%)	+1-6	15	0	-	9 (18%)

Table 5

Mean Age Deviations[1] (In Years) of

Students Taking One of the Four Levels

of The Stanford Achievement Test in Large Type or Braille

	Primary Battery Level II	Primary Battery Level III	Intermediate Battery Level I	Intermediate Battery Level II
LT	+ 1.05	+ 1.27	+ 1.81	+ 1.53
BR	+ 1.50	+ 1.52	+ 1.42	+ 1.59
Combined	+ 1.18	+ 1.34	+ 1.67	+ 1.56

[1] Age deviation = age of student (in whole years) in assigned grade minus (-) typical age (in whole years) for that grade.

Graph 1

Mean Overall Grade vs. Mean Overall Age

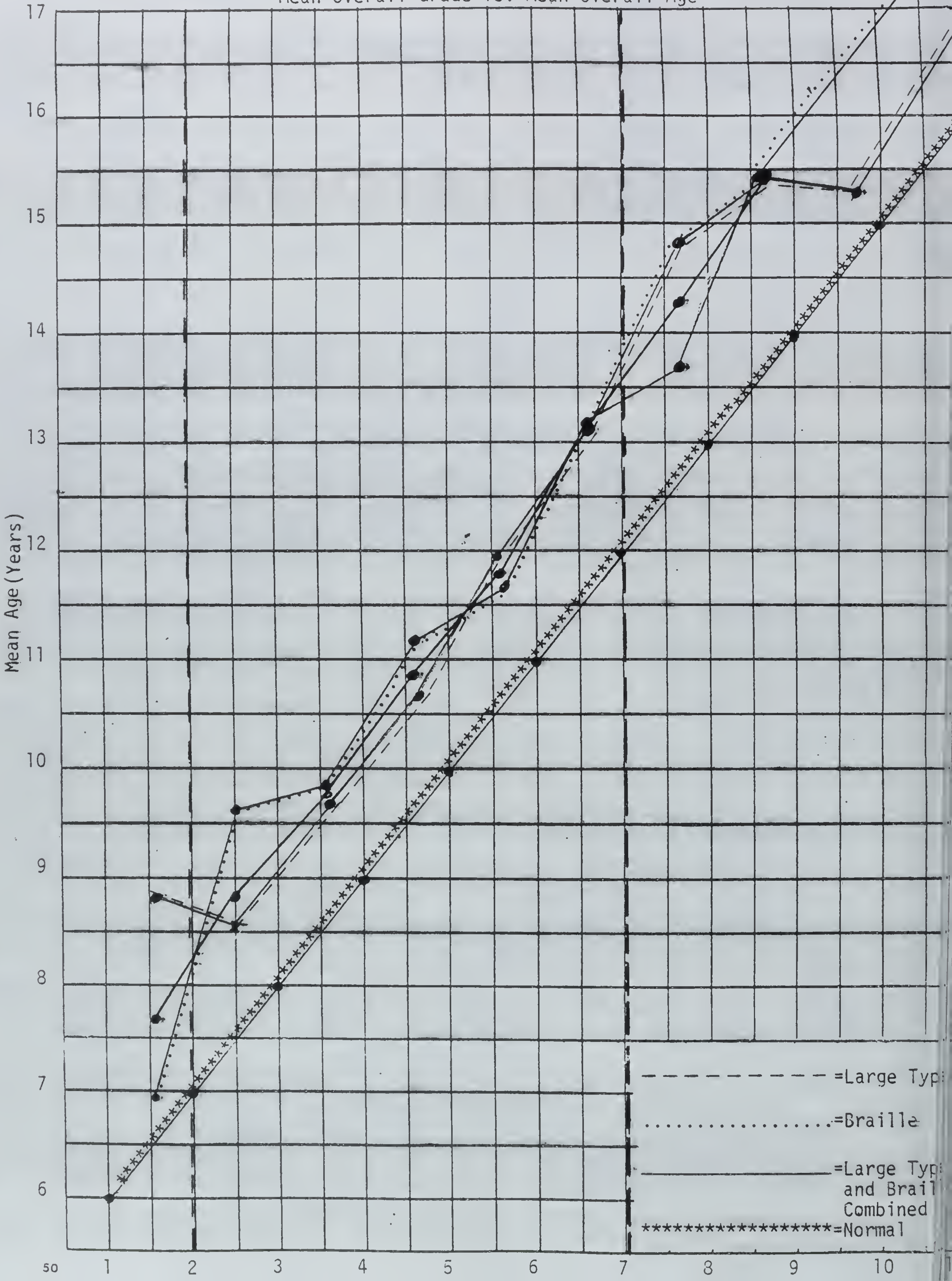

Table 6

Mean Grade Deviations[1]

For Large Type and Braille Readers

On Four Levels of the Stanford Achievement Test

	Vocabulary	Reading Comprehension	Word Study Skills	Math Concepts	Math Computation	Math Applications	Spelling	Social Science	Science	Listening Comprehension	Language
Primary Battery Level II											
LT	- .05	- .54	- .41	- .22	- .23	- .39	- .48	- .34	- .48	- .14	-
n =	60	56	60	59	60	59	58	58	56	59	
BR	- .02	-1.53[2]	- .53	- .73	- .73	- .62	- .61	-	-	- .05	-
n =	24	11	24	22	22	20	21			24	
Combined	- .04	-	- .45	- .36	- .36	- .45	- .52	-	-	- .12	-
Primary Battery Level III											
LT	- .83	-1.22	- .89	- .63	- .65	-1.04	-1.07	- .96	-1.02	- .52	-1.18
n =	73	68	73	74	74	74	74	73	72	72	72
BR	- .17	- .66	+ .47	- .96	- .63	- .65	+ .50	-1.21	- .74	- .50	- .78
n =	28	27	28	29	29	28	28	27	27	28	28
Combined	- .64	-1.06	- .51	- .72	- .65	- .93	- .64	-1.03	- .94	- .51	-1.07

Table 6 (continued)

	Vocabulary	Reading Comprehension	Word Study Skills	Math Concepts	Math Computation	Math Applications	Spelling	Social Science	Science	Listening Comprehension	Language
Intermediate Battery Level I											
LT	- .55	+ .01	- .71	- .63	- .16	- .81	- .81	- .35	- .36	- .56	- .12
n =	43	38	43	43	43	43	42	42	42	43	42
BR.	+ .38	+ .74	- .39	- .91	- .84	- .81	+ .22	- .94	- .07	+ .50	+ .44
n =	26	24	26	26	26	24	26	20	20	22	26
Combined	- .20	+ .29	- .59	- .73	- .42	- .81	- .42	- .54	- .27	- .20	+ .10
Intermediate Battery Level II											
LT	- .39	+ .70	- .31	- .22	- .45	- .25	- .65	- .15	- .02	+ .06	+ .43
n =	62	60	63	63	63	63	63	64	64	63	63
BR	- .36	+ .13	- .30	-1.53	-1.50	-1.20	- .32	-1.00	- .34	+ .01	+ .59
n =	49	42	49	49	49	43	47	41	40	44	47
Combined	- .38	+ .47	- .31	- .79	- .91	- .63	- .51	- .48	- .14	+ .04	+ .50

[1] Grade deviation = grade equivalent minus (-) actual grade.

[2] Part A was edited out of the braille editions. Therefore, only Part B was administered. This score should be viewed lightly since according to Morris (1974), of prime importance is that all parts of a test must be given. Parts are not equivalent and a total score may not be prorated from partial information.

Table 7

Primary Battery Level II

Large Type

Math Applications				Math Computation				Math Concepts			
Form A n = 26		Form B n = 7		Form A n = 26		Form B n = 7		Form A n = 25		Form B n = 7	
1.	- 1.5	1.	- 5.3	1.	+ 7.0	* 1.	-25.1	1.	+ 3.0	* 1.	-57.4
2.	+11.7	* 2.	-25.4	2.	+ 1.2	2.	- 8.3	2.	-13.0	* 2.	-45.9
3.	+13.5	3.	-19.4	3.	+ 0.5	3.	-17.6	3.	+13.0	* 3.	-37.4
4.	+ 2.2	* 4.	-36.9	4.	+ 6.2	* 4.	-33.9	4.	+ 3.0	* 4.	-26.9
5.	+20.2	5.	-10.1	5.	-11.8	* 5.	-42.1	5.	+ 5.0	* 5.	-58.7
6.	- 3.0	* 6.	-32.7	6.	-11.9	* 6.	-43.1	6.	+ 4.0	* 6.	-39.4
7.	- 3.7	* 7.	-24.9	7.	+ 3.9	7.	- 3.1	7.	+14.0	7.	- 2.3
8.	+ 5.5	* 8.	-38.4	8.	- 8.6	8.	- 6.1	8.	- 8.0	* 8.	-39.1
9.	+ 1.2	* 9.	-49.0	9.	- 4.6	9.	-12.9	9.	+ 7.0	* 9.	-60.2
10.	+15.1	*10.	-36.6	10.	+13.2	10.	-11.6	10.	+ 6.0	10.	+ 1.4
11.	- 1.5	*11.	-55.5	11.	+10.9	11.	-17.1	11.	+20.0	*11.	-39.6
12.	+16.3	12.	-16.6	12.	+ 7.6	12.	-17.4	12.	+16.0	12.	+ 3.4
13.	+15.7	13.	- 4.9	13.	- 1.1	13.	+ 9.9	13.	- 3.0	13.	-17.9
14.	+ 6.2	*14.	-28.7	14.	+ 6.2	14.	- 5.3	14.	-11.0	14.	- 8.4
15.	+21.6	15.	-20.6	15.	+ 8.6	*15.	-26.9	15.	+ 9.0	*15.	-45.9
16.	+14.8	16.	-15.1	16.	+ 6.8	*16.	-36.6	16.	+ 5.0	16.	-11.1
17.	+ 5.1	*17.	-37.4	17.	+18.6	*17.	-33.6	17.	+ 3.0	*17.	-55.5
18.	- 2.4	18.	+ 9.1	18.	+11.9	*18.	-37.4	18.	- 6.0	*18.	-33.4
19.	- 7.8	19.	- 0.1	19.	+ 8.2	19.	+14.1	19.	- 7.0	19.	- 7.4
20.	-20.1	*20.	-30.9	20.	+11.5	20.	-10.4	20.	+15.0	20.	+ 1.1
21.	-10.5	21.	-20.4	21.	+ 0.8	*21.	-25.2	21.	+12.0	*21.	-47.2
22.	-10.5	*22.	-49.7	22.	+23.1	22.	-13.1	22.	+18.0	*22.	-26.2
23.	-13.8	*23.	-27.1	23.	+18.4	23.	-15.6	23.	-10.0	23.	+11.9
24.	- 7.0	*24.	-45.7	24.	- 1.1	24.	- 3.9	24.	- 7.0	*24.	-37.2
25.	+ 9.8	25.	+ 2.6	25.	- 7.8	25.	-13.2	25.	-11.0	25.	- 5.4
26.	+ 2.0	*26.	-47.0	26.	- 4.9	26.	- 0.4	26.	- 7.0	*26.	-47.7
27.	- 6.3	27.	+20.9	27.	-11.8	27.	- 2.9	27.	- 8.0	*27.	-24.9
28.	- 3.4	*28.	-55.0	28.	+ 2.7	28.	- 4.4	28.	+ 9.0	*28.	-32.2
				29.	+23.1	29.	+ 1.6	29.	- 5.0	29.	+ 1.9
				30.	+ 7.3	*30.	-41.6	30.	- 8.0	*30.	-24.7
				31.	+30.3	31.	+20.2	31.	-11.0	*31.	-43.9
				32.	+13.1	*32.	-31.4	32.	+ 3.0	*32.	-53.0
				33.	+16.1	33.	- 6.4	33.	- 6.0	*33.	-27.2
				34.	-23.4	*34.	-34.9	34.	+22.0	34.	-23.4
				35.	- 2.5	*35.	-40.0	35.	- 7.0	*35.	-35.8
				36.	+12.1	36.	+ 3.1				
				37.	+20.9	37.	-22.9				

Table 8

Primary Battery Level II

Braille

Math Applications				Math Computation				Math Concepts			
	Form A n = 6		Form B n = 5		Form A n = 6		Form B n = 4		Form A n = 6		Form B n = 5
1.	+10.0	1.	+ 9.0	* 1.	-43.0	1.	+ 3.5	1.	+ 7.0	1.	+14.0
2.	+37.3	2.	- 2.5	* 2.	-45.0	2.	+ 6.0	* 2.	-55.7	* 2.	-34.5
3.	+25.0	3.	+23.5	3.	-21.3	3.	-14.0	3.	+ 3.7	3.	+34.0
4.	+33.0	4.	+14.5	4.	- 6.7	4.	-16.0	4.	-14.3	4.	+16.0
5.	+ 7.3	5.	+ 7.0	5.	-14.3	5.	-10.0	5.	- 4.3	5.	+27.0
6.	-19.7	6.	- 7.0	* 6.	-35.0	6.	+14.0	6.	- .7	6.	+12.0
* 7.	-29.3	7.	-22.0	7.	-23.0	7.	+ 0.5	7.	+22.0	7.	+12.0
8.	+27.3	8.	+13.0	8.	-24.0	8.	- 2.5	8.	-14.0	8.	+18.0
9.	-18.0	9.	+11.0	9.	+13.3	9.	-20.0	* 9.	-43.7	* 9.	-34.5
10.	+25.3	10.	+ 0.5	10.	- 6.0	10.	- 4.5	10.	+ 9.3	11.	- 2.5
*11.	-63.0	11.	+24.5	*11.	-32.7	*11.	-35.0	11.	+27.3	12.	+12.0
12.	+ 7.3	12.	+20.5	*12.	-27.0	12.	+ 0.5	12.	+15.3	13.	+25.0
13.	- 8.7	13.	- 2.0	13.	+ 5.3	13.	+17.0	*13.	-50.3	14.	- 5.5
14.	+20.3	14.	+37.0	14.	-23.3	14.	-16.0	*14.	-33.7	16.	+26.0
15.	+ 3.7	*15.	-32.0	15.	- 9.3	*15.	-34.0	16.	-17.0	17.	+44.5
16.	-16.0	16.	+13.5	16.	- 7.3	16.	- 4.5	*17.	-35.7	18.	- 2.0
17.	-18.0	17.	- 6.0	*17.	-32.7	17.	- 1.5	*18.	-28.7	19.	+ 4.0
18.	+13.0	18.	+52.0	18.	+ 1.7	18.	+ 9.0	*19.	-29.7	20.	+24.0
*19.	-54.0	19.	+28.5	*19.	-38.0	*19.	-43.0	20.	-23.7	21.	- 1.5
*20.	-47.0	20.	+ 0.5	20.	-10.3	20.	+ 7.5	21.	+ 2.7	22.	+39.5
*21.	-49.0	21.	+31.0	*21.	-30.0	*21.	-39.5	*22.	-33.3	23.	+ 0.5
22.	+17.7	22.	+16.0	22.	-16.7	22.	+19.0	*23.	-32.7	24.	+28.5
23.	+ 0.3	23.	-10.0	23.	+ 3.0	23.	+16.5	24.	- 1.0	25.	- 2.5
24.	-23.7	24.	+20.0	*24.	-28.0	24.	+17.5	25.	+ 3.0	26.	+38.0
25.	+ 6.0	25.	+25.5	25.	+23.0	25.	+22.5	26.	- 5.0	27.	+26.5
*26.	-48.0	26.	+33.0	26.	-11.3	26.	+21.0	*28.	-34.3	28.	+33.5
27.	-14.0	27.	+ 9.5	27.	+19.0	27.	+18.5	29.	+ 4.3	29.	+19.0
28.	- 4.7	28.	+25.0	28.	+11.7	28.	-11.5	*30.	-30.0	30.	+41.0
				29.	-16.7	29.	+19.5	*31.	-43.0	31.	+ 7.5
				30.	+15.0	30.	+15.5	*32.	-44.3	32.	+27.0
				*31.	-45.3	31.	+ 9.5	33.	- 4.7	33.	+38.5
				32.	+ 6.7	32.	+40.0	*34.	-41.3	34.	+ 8.0
				*33.	-40.3	33.	+11.5	*35.	-43.0	35.	+29.5
				34.	+ 8.7	34.	-13.5				
				35.	+ 9.0	35.	+10.0				
				*36.	-27.7	36.	- 4.0				
				37.	- 6.0	37.	+48.5				

Table 9

Primary Battery Level III

Large Type

Math Applications				Math Computation				Math Concepts			
	Form A n = 34		Form B n = 7		Form A n = 34		Form B n = 7		Form A n = 34		Form B n = 7
1.	+ 2.6	1.	- 3.3	1.	- 4.0	1.	+10.7	1.	- 1.1	1.	+ 9.9
2.	- 1.8	2.	- 4.1	2.	+ 5.7	2.	+ 2.7	2.	+11.9	2.	+ 2.6
3.	- 3.4	3.	-20.1	3.	+ 2.5	3.	-15.4	3.	+ 5.8	3.	+10.1
4.	- 1.7	4.	- 1.8	4.	- 1.6	4.	+ 2.7	* 4.	-24.7	4.	+ 3.9
5.	- 5.8	* 5.	-27.6	5.	+ 6.4	5.	+24.5	5.	+ 1.8	5.	+ 8.4
6.	+ 0.6	6.	-12.9	6.	+10.2	6.	-12.9	6.	+ 6.9	6.	+26.2
7.	-15.7	7.	- 5.9	7.	- 5.8	7.	+17.2	7.	- 5.4	7.	- 2.4
8.	-12.2	8.	+ 6.4	8.	+11.4	8.	+ 2.4	8.	+ 8.4	8.	- 3.1
* 9.	-25.5	9.	-22.4	9.	+ 7.0	9.	+ 6.9	9.	- 3.3	9.	+29.5
*10.	-25.4	10.	-11.4	10.	+ 3.0	10.	+13.7	10.	-14.1	10.	+20.6
11.	-23.8	11.	-21.9	11.	- 2.4	11.	- 0.1	11.	-13.8	11.	- 2.1
12.	-17.8	12.	-11.9	12.	- 2.1	12.	+32.7	12.	- 9.2	12.	-16.4
13.	- 1.5	13.	- 6.4	13.	+ 6.6	13.	+28.2	13.	+ 1.6	13.	-14.9
14.	-20.2	14.	+10.4	14.	- 0.4	14.	+31.2	14.	+ 5.5	14.	- 5.6
15.	- 9.9	15.	+ 7.9	15.	+ 3.0	15.	+ 7.9	15.	-10.2	15.	-10.6
16.	-10.9	16.	- 7.4	16.	- 5.4	16.	+27.7	16.	+ 3.9	16.	- 7.9
17.	+ 3.0	17.	- 9.4	17.	+18.7	17.	+24.7	17.	- 3.2	17.	+11.9
18.	+ 1.6	18.	- 2.6	18.	+ 0.1	18.	+10.6	18.	- 5.7	18.	+ 9.4
19.	-17.9	*19.	-43.2	19.	- 2.1	19.	+14.9	19.	-15.9	19.	- 0.4
20.	- 2.1	20.	-23.1	20.	+14.1	20.	+33.2	20.	-14.6	20.	-19.1
21.	- 9.6	21.	+28.7	21.	+ 7.2	21.	+12.9	21.	+ 6.9	21.	+31.7
22.	-16.3	22.	+15.9	22.	+ 3.9	22.	+22.6	22.	- 6.5	22.	+21.1
23.	+ 2.3	23.	+10.1	23.	+ 8.1	23.	+47.0	23.	- 0.4	23.	+ 6.4
*24.	-27.7	24.	-20.2	24.	+12.3	24.	+24.1	24.	+ 9.1	24.	+16.6
25.	- 6.6	25.	- 6.9	25.	- 5.2	25.	+10.5	25.	- 5.6	25.	+17.9
26.	- 8.9	*26.	-33.5	26.	-14.2	26.	+17.7	26.	- 2.6	26.	+20.4
27.	- 5.4	27.	- 6.6	27.	- 6.9	27.	- 4.3	27.	+ 6.6	27.	+26.7
28.	- 8.8	*28.	-39.7	28.	+ 3.6	28.	- 0.6	28.	- 7.1	28.	+22.4
				29.	-18.8	29.	+14.4	29.	- 3.9	29.	+20.1
				30.	- 6.6	30.	- 2.4	30.	-16.9	30.	+40.4
				31.	-12.9	31.	+ 5.1	31.	-17.3	31.	+ 8.4
				32.	- 7.8	32.	+14.1	32.	+13.4	32.	+17.1
				33.	+ 9.2	33.	- 9.4				
				34.	-10.9	34.	- 8.7				
				35.	+ 1.3	35.	+16.4				
				36.	+17.7	36.	-16.7				

Table 10

Primary Battery Level III

Braille

Math Applications				Math Computation				Math Concepts			
	Form A n = 12		From B n = 5		Form A n = 12		Form B n = 5		Form A n = 11		Form B n = 6
1.	+ 8.5	1.	- 9.0	* 1.	-30.5	1.	+25.0	1.	-19.9	1.	-11.5
2.	-15.0	2.	-15.5	2.	-10.5	2.	- 3.0	* 2.	-43.2	2.	- 4.5
3.	- 4.3	3.	+17.0	3.	- 7.3	3.	+ 7.5	3.	-20.4	3.	-13.7
4.	-12.0	* 4.	-47.5	* 4.	-31.0	4.	- 3.0	* 4.	-41.8	4.	-17.5
5.	-20.5	* 5.	-70.5	5.	-14.7	5.	-15.5	* 5.	-41.8	5.	-13.0
6.	-11.7	* 6.	-50.0	* 6.	-31.0	6.	+10.0	6.	+ 8.5	6.	+23.8
7.	-24.5	* 7.	-43.0	7.	- 3.8	7.	- 8.5	* 7.	-39.6	* 7.	-26.2
8.	-12.7	* 8.	-45.0	8.	-18.0	8.	+11.0	8.	-19.5	8.	- 7.8
9.	-17.2	9.	-19.5	9.	-16.5	9.	- 4.5	9.	-22.5	9.	+12.8
10.	+10.8	10.	+11.5	10.	-20.5	10.	-12.0	10.	- 1.0	*10.	-36.5
11.	-20.3	11.	+29.5	11.	-14.7	11.	-11.5	*11.	-24.7	11.	+21.7
12.	+10.7	12.	- 9.0	12.	-13.3	12.	-13.0	12.	+19.1	12.	+ 9.8
13.	- 9.8	13.	-23.5	*13.	-30.7	13.	+ 2.5	13.	-18.2	13.	+56.5
14.	-22.2	*14.	-41.0	14.	-19.5	14.	+ 5.5	*14.	-31.6	14.	+18.2
15.	- 2.5	15.	+25.0	15.	- 5.3	15.	- 3.5	15.	0	*15.	-32.0
16.	- 5.0	*16.	-36.0	16.	-19.2	16.	+ 2.0	*16.	-24.7	16.	-15.0
17.	-13.7	17.	- 6.5	17.	- 4.3	17.	- 1.0	17.	-11.2	*17.	-59.5
18.	-12.2	18.	- 5.5	18.	- 5.3	18.	+13.5	18.	- 4.6	*18.	-62.0
19.	-23.3	19.	+ 2.5	19.	- 5.0	19.	+23.5	*19.	-41.8	*19.	-57.5
20.	-13.3	*20.	-26.0	20.	- 6.5	20.	-12.5	20.	- 6.9	20.	+ 4.7
21.	+20.8	21.	+ 3.0	21.	+ 2.3	21.	-10.0	*21.	-30.8	*21.	-37.3
*22.	-29.5	22.	-15.5	22.	+ 6.3	22.	+25.5	22.	+12.5	22.	-19.3
23.	-14.8	23.	- 7.0	23.	+14.0	*23.	-33.0	23.	+10.8	23.	+18.3
24.	- 4.7	24.	-14.5	24.	+25.5	24.	-13.0	24.	-10.7	24.	-23.8
25.	+ 4.2	25.	- 4.0	25.	-15.5	25.	- 9.5	25.	-13.0	*25.	-36.8
26.	+ 2.3	26.	+ 6.5	*26.	-39.7	*26.	-68.0	*26.	-31.2	26.	- 1.0
27.	- 2.5	27.	+10.5	27.	-19.2	27.	-10.0	27.	- 1.1	*27.	-59.0
28.	+ 3.0	28.	-14.0	28.	-18.5	*28.	-43.5	*28.	-27.4	28.	-15.7
				29.	-18.3	29.	-17.0	29.	-11.6	29.	- 3.7
				30.	-11.0	30.	-11.0	31.	+ 8.1	30.	+35.7
				31.	-18.3	31.	-12.0	*32.	-30.4	*31.	-46.3
				32.	-12.7	*32.	-43.0			32.	0
				33.	+ 9.7	33.	-18.0				
				34.	-14.8	34.	-23.0				
				35.	-17.3	*35.	-26.5				
				36.	+21.2	*36.	-31.0				

Table 11

Intermediate Battery Level I

Large Type

Math Applications				Math Computation				Math Concepts			
Form A n = 23		Form B n = 12		Form A n = 23		Form B n = 12		Form A n = 23		Form B n = 12	
1.	+ 8.2	1.	+10.0	1.	- 9.8	1.	-16.2	1.	- 6.8	1.	+ 2.7
2.	- 4.4	2.	- 4.0	2.	- 1.9	2.	- 2.8	2.	- 3.3	2.	+ 4.2
3.	+ 5.1	3.	-14.2	3.	+ 4.4	3.	+12.7	3.	- 5.3	3.	+ 2.0
4.	-11.7	4.	+13.0	4.	+ 6.9	4.	+ 9.5	4.	-12.3	4.	+12.5
5.	-16.1	5.	-17.5	5.	- 5.4	5.	+21.7	5.	- 3.3	5.	-21.3
6.	+ 5.2	* 6.	-36.8	6.	+ 7.7	6.	+15.8	6.	-24.2	6.	+ 6.8
7.	+ 0.1	7.	-23.5	7.	- 0.5	7.	+14.8	7.	- 0.6	7.	-20.3
8.	- 5.4	8.	- 8.7	8.	+ 5.4	8.	+ 7.0	8.	-15.3	* 8.	-25.0
9.	+ 4.1	9.	+ 8.8	9.	+25.6	9.	+ 1.7	9.	- 4.3	9.	- 0.5
10.	- 1.1	10.	+11.0	10.	+13.1	10.	- 0.8	10.	-10.0	10.	+ 4.8
11.	- 0.3	11.	+18.3	11.	+14.5	11.	+30.0	11.	+ 2.5	*11.	-27.7
12.	- 2.3	12.	-15.7	12.	- 3.8	12.	- 1.5	12.	-13.5	12.	-12.7
13.	- 0.2	*13.	-37.2	13.	+12.5	13.	- 2.8	13.	-16.8	13.	-12.5
14.	-12.8	14.	- 0.2	14.	- 0.8	14.	- 6.2	14.	+13.6	14.	+13.0
15.	+ 1.1	15.	- 9.2	15.	+ 6.2	15.	-10.7	15.	+ 0.3	15.	+25.5
*16.	-25.5	*16.	-26.3	16.	+27.0	16.	+13.5	16.	-19.0	16.	+ 2.0
17.	+ 9.6	17.	+ 0.8	17.	- 0.5	17.	- 2.0	17.	+ 0.2	17.	+ 6.3
18.	- 1.1	18.	-21.7	18.	+ 2.5	18.	+30.0	18.	+ 5.5	18.	+ 4.5
19.	+14.0	*19.	-34.5	19.	+10.5	19.	+23.0	19.	- 4.4	19.	+ 3.0
20.	- 7.9	*20.	-31.2	20.	+ 1.6	20.	- 6.0	20.	-14.8	20.	-22.3
21.	- 3.3	21.	+ 8.5	21.	+ 4.4	21.	- 4.3	21.	- 9.4	21.	-12.3
22.	-17.5	22.	+ 0.7	22.	+12.5	22.	-12.7	22.	- 2.2	22.	+20.2
23.	- 2.8	23.	+16.5	23.	- 0.1	23.	- 0.7	23.	-10.2	23.	-10.7
24.	- 8.3	24.	+ 4.2	24.	- 9.5	24.	-18.7	24.	-12.9	24.	+14.7
*25.	-24.6	25.	-16.2	25.	-13.0	25.	-23.7	25.	- 2.7	25.	-16.3
26.	+ 3.0	26.	+ 0.8	26.	- 1.8	26.	+17.5	26.	+ 1.8	26.	- 4.8
27.	-16.5	*27.	-24.8	27.	-13.2	27.	-11.7	27.	- 1.5	27.	- 6.2
28.	-11.4	*28.	-29.7	28.	- 1.6	28.	+ 8.7	28.	- 4.1	28.	+12.8
29.	+ 8.6	29.	+24.8	29.	+18.5	*29.	-33.2	29.	+ 7.3	29.	+ 5.2
30.	- 0.3	*30.	-28.8	30.	- 6.1	30.	-11.0	30.	-11.3	30.	-11.3
31.	- 5.9	31.	- 5.2	31.	+12.5	31.	-13.0	31.	- 1.4	31.	- 6.5
32.	- 4.7	32.	-14.2	32.	+12.8	32.	+23.2	32.	- 8.3	32.	+25.7
33.	-14.2	*33.	-36.2	33.	+ 1.1	33.	+22.8				
34.	+10.8	34.	+25.3	34.	- 4.9	34.	+ 0.8				
*35.	-31.8	35.	+15.2	35.	+ 2.9	35.	+32.3				
36.	- 4.2	36.	-18.5	36.	- 5.9	36.	+ 3.5				
37.	+ 4.3	37.	-11.7	37.	- 0.7	37.	-18.3				
38.	+ 6.9	38.	+ 2.5	38.	- 1.7	38.	- 3.7				
39.	-12.6	39.	- 5.7	39.	+ 8.5	39.	+ 9.5				
40.	+ 1.1	40.	-11.0	40.	- 5.6	40.	+ 8.3				

Table 12

Intermediate Battery Level I

Braille

Math Applications				Math Computation				Math Concepts			
	Form A n = 15		Form B n = 5		Form A n = 16		Form B n = 5		Form A n = 16		Form B n = 5
1.	- 7.5	1.	+10.0	* 1.	-25.0	1.	-14.5	1.	-15.8	1.	- 9.0
* 3.	-37.5	3.	+ 7.5	* 2.	-27.7	2.	- 9.5	2.	-12.3	2.	- 7.5
5.	-10.3	5.	- 7.5	* 3.	-57.0	3.	+21.0	3.	-14.3	3.	-13.0
9.	- 5.2	9.	+ 5.5	4.	-23.2	4.	+14.5	4.	-20.7	4.	-22.5
*11.	-38.8	11.	- 5.0	5.	-12.5	5.	+10.0	5.	- 5.5	5.	+22.0
*13.	-31.5	*13.	-50.5	6.	-20.0	6.	+12.5	6.	- 9.0	6.	+23.5
*14.	-24.7	14.	+21.5	7.	-13.2	7.	+31.5	7.	- 5.3	7.	- 2.0
*15.	-28.2	*15.	-27.5	8.	-11.7	8.	+32.0	8.	-17.5	8.	-15.0
17.	+20.3	17.	-17.5	9.	- 7.0	9.	+15.0	9.	- 7.0	* 9.	-35.5
19.	-13.0	*19.	-39.5	*10.	-25.3	10.	+12.5	*10.	-29.0	*10.	-38.5
22.	+ 5.7	22.	+14.0	11.	- 4.0	11.	+15.0	11.	+ 2.2	11.	-21.0
23.	- 1.7	23.	+41.5	12.	- 6.0	12.	+ 8.5	12.	- 0.8	12.	+ 9.0
*25.	-28.3	*25.	-29.5	13.	+18.5	13.	- 4.5	13.	-19.7	*13.	-42.5
*27.	-46.7	27.	+18.5	14.	- 9.8	14.	- 4.5	14.	-12.2	14.	- 2.0
29.	+ 5.7	*29.	-38.5	*15.	-27.2	15.	+16.0	15.	+ 9.5	15.	- 9.5
31.	+ 1.7	31.	+ 1.5	*16.	-35.0	16.	- 1.5	*16.	-25.0	*16.	-28.0
33.	-22.3	33.	- 4.5	17.	-13.2	*17.	-32.0	17.	+16.8	17.	+ 8.0
35.	- 7.2	*35.	-51.5	18.	+ 2.8	18.	- 5.0	18.	- 1.0	18.	+14.5
37.	-10.2	37.	- 5.0	19.	+ 4.7	19.	+ 3.0	19.	-24.3	19.	- 2.0
39.	-16.3	39.	+ 1.0	*20.	-30.5	20.	+ 4.0	*20.	-30.3	*20.	-39.0
* 2.	-40.3	2.	+ 1.0	*21.	-32.0	21.	-11.0	21.	-17.3	21.	+11.0
4.	- 6.2	4.	- 7.0	22.	-12.0	22.	-11.0	22.	+ 0.5	22.	- 6.5
* 6.	-30.5	* 6.	-38.5	23.	-17.2	*23.	-59.0	23.	-13.8	23.	- 4.0
7.	-22.5	* 7.	-53.5	24.	-21.8	24.	+ 8.0	24.	- 1.5	24.	+ 8.0
* 8.	-48.0	8.	- 7.0	25.	-19.0	25.	-17.0	*25.	-38.0	*25.	-38.0
10.	-15.0	10.	- 4.0	*26.	-35.2	26.	+ 2.5	26.	- 1.8	*26.	-26.5
*12.	-34.2	12.	+ 6.0	27.	-23.0	27.	+15.0	*27.	-38.8	27.	+ 0.5
16.	-15.7	16.	+12.0	28.	- 6.3	28.	-18.0	28.	+ 3.0	28.	+14.5
18.	- 8.3	18.	+25.0	29.	-13.0	29.	- 1.5	29.	+ 3.3	29.	+23.5
20.	-13.7	20.	+ 0.5	*30.	-30.3	30.	-16.0	30.	-20.5	30.	- 8.0
21.	-22.2	*21.	-26.5	31.	-12.2	*31.	-38.0	31.	+ 3.3	31.	+ 8.5
24.	-20.5	24.	-22.5	32.	-10.0	32.	-23.5	32.	- 5.0	32.	-21.0
26.	-20.2	26.	-17.5	33.	- 6.8	33.	+ 4.5				
28.	-17.5	28.	- 3.0	34.	-12.2	*34.	-32.5				
30.	-12.5	30.	+14.5	35.	- 8.7	*35.	-26.0				
32.	+ 0.8	32.	- 7.5	36.	-20.0	*36.	-26.5				
34.	-10.3	*34.	-38.0	37.	- 4.3	37.	-15.0				
36.	-12.3	36.	- 3.5	38.	-11.5	38.	-17.0				
38.	-16.8	38.	+32.5	39.	-16.2	39.	- 0.5				
40.	+ 8.3	40.	-16.0	40.	+ 8.2	40.	+15.0				

Table 13

Intermediate Battery Level II

Large Type

Math Applications				Math Computation				Math Concepts			
	Form A n = 19		Form B n = 18		Form A n = 19		Form B n = 18		Form A n = 19		Form B n = 18
1.	+ 2.2	1.	- 3.3	1.	+ 0.2	1.	- 0.2	1.	+ 3.9	1.	+ 2.8
2.	+ 4.2	2.	+ 1.8	2.	- 6.1	2.	+14.0	2.	+ 2.2	2.	- 0.7
3.	+ 1.9	3.	+ 4.3	3.	- 5.3	3.	+ 5.3	3.	+ 3.9	3.	+10.4
4.	- 4.8	4.	- 4.2	4.	+ 5.9	4.	+ 1.2	4.	-17.4	4.	-14.4
5.	-20.8	5.	+ 1.8	5.	-14.1	5.	+ 7.8	5.	+ 0.9	5.	- 8.3
6.	- 5.1	6.	+21.9	6.	+ 4.9	6.	+13.8	6.	-13.4	6.	+ 8.9
7.	+ 5.4	7.	+ 5.8	7.	+ 7.4	7.	+10.8	7.	+ 2.2	7.	- 0.2
8.	- 0.6	8.	+ 3.7	8.	+ 2.2	8.	- 5.4	8.	+ 6.7	8.	+21.3
9.	- 0.8	9.	+ 6.8	9.	- 1.6	9.	-11.4	9.	-21.4	9	- 1.8
10.	- 0.1	10.	+12.3	10.	-12.6	10.	+ 4.7	10.	-17.4	10.	+17.8
11.	+ 9.2	11.	- 8.1	11.	+11.4	11.	+12.7	11.	- 3.6	11.	+ 9.8
12.	+ 7.5	12.	+27.4	12.	+18.7	12.	-12.7	12.	+11.7	12.	+25.8
13.	+ 7.4	13.	+ 3.8	13.	+ 8.2	13.	- 7.9	13.	+14.9	13.	+ 5.4
14.	+ 4.9	14.	+ 6.1	14.	- 7.8	14.	- 5.3	14.	+ 0.8	14.	+20.2
15.	-10.1	15.	+ 7.2	*15.	-31.4	*15.	-25.7	15.	+16.4	15.	- 2.4
16.	+ 4.4	16.	- 2.6	16.	- 8.9	16.	+ 1.0	16.	+27.5	16.	+13.9
17.	- 5.1	17.	+15.9	17.	-14.4	17.	+25.8	17.	+16.4	17.	+10.7
18.	- 4.6	18.	-24.2	18.	-23.9	18.	+18.7	18.	-12.2	18.	+23.0
19.	+ 3.9	19.	-16.6	19.	+28.9	19.	- 1.2	19.	-10.4	19.	+ 4.6
20.	- 1.4	20.	-20.7	*20.	-29.9	20.	+ 3.4	20.	-10.4	20.	+ 2.1
21.	+ 4.4	21.	+ 8.0	21.	- 3.2	21.	+ 1.4	21.	-20.4	21.	+26.3
22.	+29.9	22.	- 8.1	22.	-13.7	22.	+20.2	22.	+12.4	22.	+24.7
23.	-11.6	23.	- 6.9	23.	- 4.9	23.	-12.7	23.	+ 6.9	23.	- 5.1
24.	-12.2	24.	- 8.1	24.	- 7.9	24.	+21.7	24.	+10.2	24.	+ 7.7
25.	+ 0.4	25.	+ 4.0	25.	+ 7.7	25.	+27.4	25.	- 0.6	25.	+ 7.7
26.	+10.2	26.	- 9.9	26.	+ 6.7	26.	+14.9	26.	+22.7	26.	- 8.8
27.	+11.7	27.	+ 7.4	27.	+ 7.7	27.	+12.8	27.	- 6.9	27.	+12.6
28.	-11.2	28.	+ 2.4	28.	+ 9.4	28.	+20.8	28.	+ 1.6	28.	-13.7
29.	- 1.9	29.	+ 5.7	29.	- 2.4	29.	+14.8	29.	+ 7.4	29.	+ 8.9
30.	+ 0.4	30.	+ 9.0	*30.	-24.9	30.	+22.2	30.	- 2.2	30.	-11.8
31.	+ 0.1	31.	-22.3	31.	+ 2.9	31.	+ 7.1	31.	+ 0.1	31.	+19.1
32.	+ 6.1	32.	+34.2	32.	+ 4.9	32.	+ 6.7	32.	+ 5.8	32.	+10.6
33.	-12.4	33.	-21.8	33.	+ 1.9	33.	+ 5.7	33.	+10.4	33.	- 4.3
34.	- 7.6	34.	+10.7	34.	-10.2	34.	-13.7	34.	+ 4.1	34.	- 7.8
35.	+13.4	35.	-12.8	35.	- 8.2	35.	- 0.6	35.	- 9.2	35.	-23.9
36.	+ 7.4	*36.	-31.4	36.	+ 6.6	36.	+ 3.4				
37.	- 3.9	37.	- 4.8	37.	- 9.7	37.	-13.8				
38.	- 9.7	38.	- 1.2	38.	+13.9	38.	+12.6				
39.	- 7.9	39.	- 6.9	39.	- 7.2	39.	- 2.6				
40.	+ 4.3	40.	+ 5.3	40.	+ 5.1	40.	+ 3.4				
				41.	+18.2	41.	+10.0				
				42.	- 1.6	42.	+ 0.3				
				43.	+ 4.8	43.	+13.4				
				44.	+ 3.3	44.	- 1.2				
				45.	-17.7	45.	+ 0.3				

Table 14

Intermediate Battery Level II

Braille

Math Applications				Math Computation				Math Concepts			
Form A n = 18		Form B n = 7		Form A n = 21		Form B n = 9		Form A n = 21		Form B n = 9	
1.	- 9.8	1.	+ 1.4	1.	- 3.0	1.	+10.9	1.	+ 1.2	1.	-19.4
3.	-10.3	3.	+ 6.7	2.	- 8.8	2.	-19.3	2.	-20.1	2.	-6.2
* 5.	-34.0	5.	+ 9.7	3.	- 2.8	3.	- 0.2	* 3.	-60.7	* 3.	-39.6
7.	-13.0	7.	-14.9	* 4.	-30.1	4.	+17.9	* 4.	-31.9	* 4.	-36.7
*9.	-29.4	9.	+ 0.4	5.	-14.9	5.	+30.0	* 5.	-39.9	5.	-19.4
11.	-13.9	11.	- 4.1	6.	+11.7	6.	+ 2.7	* 6.	-42.2	* 6.	-46.7
*13.	-33.2	13.	-16.9	7.	- 8.6	7.	+10.8	7.	-20.1	7.	-11.3
*17.	-29.7	17.	- 1.6	* 8.	-32.4	8.	-16.6	8.	-24.1	8.	+15.8
19.	-20.7	19.	+10.4	9.	- 8.1	9.	- 0.3	9.	-24.4	9.	-18.4
21.	-14.0	21.	+29.4	10.	- 2.9	10.	+ 4.7	*10.	-31.9	*10.	-26.7
*23.	-36.8	23.	-10.9	11.	+ 4.9	11.	- 9.6	11.	+ 1.4	11.	- 1.3
*25.	-24.8	25.	- 3.1	12.	+ 6.9	12.	+20.7	12.	- 9.6	12.	+14.7
27.	-23.1	27.	- 8.4	13.	+ 0.2	13.	+ 8.8	13.	-11.6	13.	+27.7
28.	-20.2	28.	+ 0.9	14.	+ 0.4	14.	+ 5.8	14.	-16.4	14.	- 7.6
29.	-16.2	29.	- 3.9	*15.	-39.2	*15.	-36.8	15.	-18.7	15.	-13.6
31.	-19.8	31.	-10.4	16.	-12.9	16.	-15.7	*16.	-57.2	16.	-19.4
33.	-21.8	33.	- 1.1	17.	-12.7	17.	- 7.6	17.	- 4.4	17.	+10.7
36.	+10.0	36.	- 8.4	18.	- 6.9	18.	+ 7.6	18.	-10.9	18.	+17.4
37.	- 7.1	37.	+ 1.6	19.	-11.9	19.	-17.9	*19.	-44.0	*19.	-28.8
39.	-12.3	39.	- 3.7	*20.	-27.2	20.	-18.8	20.	-23.0	*20.	-25.7
2.	-18.9	* 2.	-33.1	21.	-16.2	21.	-20.8	*21.	-28.2	*21.	-34.8
4.	-22.3	4.	-10.6	22.	-16.2	22.	- 7.6	22.	- 8.4	22.	-19.8
6.	+ 4.9	6.	+ 4.4	23.	-23.2	23.	-12.7	*23.	-32.0	23.	-21.8
* 8.	-30.1	* 8.	-34.4	*24.	-26.2	24.	-11.7	*24.	-38.7	*24.	-25.7
10.	-23.4	*10.	-28.1	25.	-18.4	25.	-11.4	25.	- 5.1	25.	+ 7.7
12.	-20.9	12.	+ 4.4	26.	+ 9.2	26.	+14.9	26.	-22.4	27.	+12.6
14.	-19.7	14.	+16.4	27.	-13.6	27.	- 9.4	27.	+22.4	28.	- 2.6
*15.	-29.1	*15.	-36.4	*28.	-40.0	28.	- 1.4	28.	- 6.2	29.	-18.9
16.	-14.0	16.	- 4.1	29.	-16.9	29.	- 7.4	29.	-11.4	30.	- 0.7
18.	-18.7	18.	-23.4	30.	- 7.9	30.	+16.7	*30.	-29.5	31.	+ 2.4
20.	-15.1	*20.	-54.0	*31.	-26.4	31.	+12.7	31	+ 0.9	32.	+10.6
22.	- 4.6	22.	+10.1	32.	-19.7	*32.	-37.8	32.	+ 2.3	33.	+23.4
24.	-10.1	24.	-18.4	*33.	-27.4	*33.	-38.8	33.	+ 1.1	34.	+ 3.3
26.	+ 2.6	26.	+14.7	34.	-13.7	*34.	-24.8	34.	- 9.4	35.	- 1.7
30.	- 2.6	30.	+ 1.9	*35.	-30.7	35.	- 0.6	35.	-22.2		
32.	-13.8	32.	- 9.4	*36.	-31.7	36.	-18.8				
34.	-21.7	34.	+29.7	37.	-17.0	37.	-13.8				
*35.	-49.4	35.	- 6.4	*38.	-29.7	38.	+34.8				
38.	- 8.2	38.	-14.7	39.	-20.2	39.	-13.7				
40.	+ 5.8	40.	-13.7	40.	-13.2	40.	-18.8				
				*41.	-26.0	*41.	-28.9				
				42.	-20.4	42.	+11.4				
				43.	-17.7	43.	- 8.8				
				44.	-13.5	44.	-17.9				
				45.	+ 0.8	45.	-10.8				

Table 15

Standard Errors of Measurement

Subtest	Form A No. items	Form A Standard error of measurement	Form B No. items	Form B Standard error of measurement
Primary Battery Level II				
Math. Concepts	35(33)	2.5(2.5)	35(33)	2.5(2.5)
Math. Computation	37	2.4	37	2.4
Math. Applications	28	2.3	28	2.2
Primary Battery Level III				
Math. Concepts	32(31)	2.5(2.7)	32	2.5
Math. Computation	36	2.5	36	2.5
Math. Applications	28	2.0	28	2.0
Intermediate Battery Level I				
Math. Concepts	35	2.6	35(34)	2.5(2.4)
Math Computation	45	2.9	45	2.9
Math Applications	40	2.6	40	2.6
Intermediate Battery Level II				
Math Concepts	35	2.6	35(34)	2.5(2.4)
Math Computation	45	2.9	45	2.9
Math Applications	40	2.6	40	2.6

Note: Item totals and standard errors of measurement in parentheses indicate braille statistics which differ from large type or regular type statistics.

Table 16

Proportion of Extremely Difficult Items*
On the Three Math Subtests
For Four Levels of the
Stanford Achievement Test
Form A and Form B

Level	Total N	Total no. of items	No. of items at or below -25% cutoff	Math subtests: Applications	Math subtests: Computation	Math subtests: Concepts	Math subtests: Overall
Braille							
Primary II	10-11	196	40	.12	.22	.26	.20
Primary III	16-18	191	42	.16	.15	.35	.22
Intermediate I	20-21	224	49	.26	.20	.19	.22
Intermediate II	25-30	239	50	.18	.19	.28	.21
				.19	.19	.27	.21
Large Type							
Primary II	32-33	200	52	.29	.18	.33	.26
Primary III	41	192	8	.12	.00	.02	.04
Intermediate I	35	224	15	.15	.01	.03	.07
Intermediate II	37	240	5	.01	.04	.00	.02
				.13	.06	.10	.09
Large Type							
Primary II**	25-26	100	0	.00	.00	.00	.00
Primary III	41	192	8	.12	.00	.02	.04
Intermediate I	35	224	15	.15	.01	.03	.07
Intermediate II	37	240	5	.01	.04	.00	.02
				.08	.02	.01	.04

* An item was considered extremely difficult if the percent of legally blind students answering the item correctly minus the item difficulty value equaled - 25% or more.

** Form A only.

Table 17

Primary Battery Level II

Math Applications

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	1. Solution of a One-Step Problem	1,5,6,8,9,10,11		1,2,3,5,6,8,9,10,11
Large type n=26		Difficult Item(s) None	n=7	Difficult Item(s) 2,6,8,9,10,11
Braille n=6		Difficult Item(s) 11	n=5	Difficult Item(s) None
	2. Analysis and Development of a Solution Design	2,3,7,12,13,14,18,27,28		7,12,13,14,18,27,28
Large type n=26		Difficult Item(s) None	n=7	Difficult Item(s) 7,14,28
Braille n=6		Difficult Item(s) 7	n=5	Difficult Item(s) None
	3. Measurement and Graphs	4,15,16,17,19,20,21,22,23,24,25,26		4,15,16,17,19,20,21,22,23,24,25,26
Large type n=26		Difficult Item(s) None	n=7	Difficult Item(s) 4,17,20,22,23,24,26
Braille n=6		Difficult Item(s) 19,20,21,26	n=5	Difficult Item(s) 15

Table 18

Primary Battery Level II

Math Computation

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	1. Knowledge of Primary Facts	1,2,3,4,5,6,7,11,14,15,16,17,18,19,20,21,30,31,32,33,34,35,36,37		1,2,3,4,5,6,7,11,14,15,16,17,18,19,20,21,30,31,32,33,34,35,36,37
Large type n=26		Difficult Item(s) None	n=7	Difficult Item(s) 1,4,5,6,15,16,17,18,21,30,32,34,35,
Braille n=6		Difficult Item(s) 1,2,6,11,17,19,21,31,33,36	n=4	Difficult Item(s) 11,15,19,21
	2. Addition Algorithms	8,9,10,22,23,24,28,29		8,9,10,22,23,24,28,29
Large type n=26		Difficult Item(s) None	n=7	Difficult Item(s) None
Braille n=6		Difficult Item(s) 24	n=4	Difficult Item(s) None
	3. Subtraction Algorithms	12,13,25,26,27		12,13,25,26,27
Large type n=26		Difficult Item(s) None	n=7	Difficult Item(s) None
Braille n=6		Difficult Item(s) 12	n=4	Difficult Item(s) None

Table 19

Primary Battery Level II

Math Concepts

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	1. Number	1,3,8,14,19,21, 25,28,29,33		1,3,8,14,19,21, 25,28,29,33
Large type *n*=25		Difficult Item(s) None	*n*=7	Difficult Item(s) 1,3,8,21,28,33
Braille *n*=6		Difficult Item(s) 14,19,28	*n*=5	Difficult Item(s) None
	2. Notation	7,12,23,24,26,32, 35		7,12,23,24,26,32, 35
Large type *n*=25		Difficult Item(s) None	*n*=7	Difficult Item(s) 24,26,32,35
Braille *n*=6		Difficult Item(s) 23,32,35	*n*=5	Difficult Item(s) None
	3. Operations	16,17,18,22,34		16,17,18,22,34
Large type *n*=25		Difficult Item(s) None	*n*=7	Difficult Item(s) 17,18,22
Braille *n*=6		Difficult Item(s) 17,18,22,34	*n*=5	Difficult Item(s) None

Table 19 continued

Primary Battery Level II

Math Concepts

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	4. Geometry, Measurement, and Graphs	2,4,5,6,9,10,11, 13,15,20,27,30,31		2,4,5,6,9,10,11, 13,15,20,27,30,31
Large type *n*=25		Difficult Item(s) None	*n*=7	Difficult Item(s) 2,4,5,6,9,11,15, 27,30,31
Braille *n*=6		Difficult Item(s) 2,9,13,30,31	*n*=5	Difficult Item(s) 2,9

Table 20

Primary Battery Level III

Math Applications

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	1. Solution of a One-Step Problem	1,2,4,5,9,10,20		1,2,4,5,9,10,12,13,19,20,27
Large type n=34		Difficult Item(s) 9,10	n=7	Difficult Item(s) 5,19
Braille n=12		Difficult Item(s) None	n=5	Difficult Item(s) 4,5,20
	2. Analysis and Development of a Solution Design	3,11,12,13,14,17,18,19,21,25,26,27,28		3,11,14,17,18,21,25,26,28
Large type n=34		Difficult Item(s) None	n=7	Difficult Item(s) 26,28
Braille n=12		Difficult Item(s) None	n=5	Difficult Item(s) 14
	3. Measurement and Graphs	6,7,8,15,16,22,23,24		6,7,8,15,16,22,23,24
Large type n=34		Difficult Item(s) 24	n=7	Difficult Item(s) None
Braille n=12		Difficult Item(s) 22	n=5	Difficult Item(s) 6,7,8,16

Table 21

Primary Battery Level III

Math Computation

	Form A			Form B
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	1. Knowledge of Primary Facts	1-24		1-24
Large type n=34		Difficult Item(s) None	n=7	Difficult Item(s) None
Braille n=12		Difficult Item(s) 1,4,6,13	n=5	Difficult Item(s) 23
	2. Addition and Subtraction Algorithms	25-30		25-30
Large type n=34		Difficult Item(s) None	n=7	Difficult Item(s) None
Braille n=12		Difficult Item(s) 26	n=5	Difficult Item(s) 26,28
	3. Multiplication and Division Algorithms	31-36		31-36
Large type n=34		Difficult Item(s) None	n=7	Difficult Item(s) None
Braille n=12		Difficult Item(s) None	n=5	Difficult Item(s) 32.35,36

Table 22

Primary Battery Level III

Math Concepts

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	1. Number	5,7,18,20,25,27, 31,32		5,7,18,20,25,27, 31,32
Large type n=34		Difficult Item(s) None	n=7	Difficult Item(s) None
Braille n=11		Difficult Item(s) 5,7	n=6	Difficult Item(s) 7,18,25,27,31
	2. Notation	1,3,4,6,9,12,13, 14,16,21,28		1,3,4,6,9,12,13, 14,16,21,28
Large type n=34		Difficult Item(s) 4	n=7	Difficult Item(s) None
Braille n=11		Difficult Item(s) 4,14,16,21,28,32	n=6	Difficult Item(s) 21
	3. Operations	2,8,11,15,19,22, 23,24		2,8,11,15,19,22, 23,24
Large type n=34		Difficult Item(s) None	n=7	Difficult Item(s) None
Braille n=11		Difficult Item(s) 2,11,19	n=6	Difficult Item(s) 15,19

Table 22 continued

Primary Battery Level III

Math Concepts

	Form A		Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	4. Geometry and Measurement	10,17,26,29,30		10,17,26,29,30
Large type n=34		Difficult Item(s) None	n=7	Difficult Item(s) None
Braille n=11		Difficult Item(s) 26	n=6	Difficult Item(s) 10,17

Table 23

Intermediate Battery Level I

Math Applications

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	1. Solution of a One-Step Problem	1,3,4,5,9,10,11, 19,23,24,25,37		1,2,3,4,9,10,11, 19,23,24,25,37
Large type n=23		Difficult Item(s) 25	n=12	Difficult Item(s) 19
Braille n=15		Difficult Item(s) 3,11,25	n=5	Difficult Item(s) 19,25
	2. Analysis and Development of a Solution Design	17,18,22,29,31,32, 34,36		17,18,22,29,31,32, 34,36
Large type n=23		Difficult Item(s) None	n=12	Difficult Item(s) None
Braille n=15		Difficult Item(s) None	n=5	Difficult Item(s) 29,34
	3. Rate and Scale Problems	12,16,26,28,33,39		5,12,16,26,28,33, 39
Large type n=23		Difficult Item(s) 16	n=12	Difficult Item(s) 16,28,33
Braille n=15		Difficult Item(s) 12	n=5	Difficult Item(s) None

Table 23 continued

Intermediate Battery Level I

Math Applications

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	4. Measurement	2,27,30,35,38,40		27,30,35,38,40
Large type n=23		Difficult Item(s) 35	n=12	Difficult Item(s) 27,30
Braille n=15		Difficult Item(s) 27,2	n=5	Difficult Item(s) 35
	5. Graph Reading and Interpretation	6,7,8,13,14,15, 20,21		6,7,8,13,14,15, 20,21
Large type n=23		Difficult Item(s) None	n=12	Difficult Item(s) 6,13,20
Braille n=15		Difficult Item(s) 13,14,6,8,15	n=5	Difficult Item(s) 13,15,6,7,21

Table 24

Intermediate Battery Level I

Math Computation

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	1. Knowledge of Primary Facts	1-18		1-18
Large type n=23		Difficult Item(s) None	n=12	Difficult Item(s) None
Braille n=16		Difficult Item(s) 1,2,3,10,15,16	n=5	Difficult Item(s) 17
	2. Addition and Subtraction Algorithms	19,21,22,24,25, 29,36,37,38		19,21,22,24,25, 29,36,37,38
Large type n=23		Difficult Item(s) None	n=12	Difficult Item(s) 29
Braille n=16		Difficult Item(s) 21	n=5	Difficult Item(s) 36
	3. Multiplication and Division Algorithms	20,23,26,27,28, 30,31,32,33,34, 35,39,40		20,23,26,27,28, 30,31,32,33,34, 35,39,40
Large type n=23		Difficult Item(s) None	n=12	Difficult Item(s) None
Braille n=16		Difficult Item(s) 20,26,30	n=5	Difficult Item(s) 23,31,34,35

Table 25

Intermediate Battery Level I

Math Concepts

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	1. Number	3,4,8,15,17,18, 20,25,32		3,4,8,15,17,18, 20,25,32
Large type n=23		Difficult Item(s) None	n=12	Difficult Item(s) 8
Braille n=16		Difficult Item(s) 20,25	n=5	Difficult Item(s) 20,25
	2. Notation	1,5,11,12,16,22, 31		1,5,11,12,16,22, 31
Large type n=23		Difficult Item(s) None	n=12	Difficult Item(s) 11
Braille n=16		Difficult Item(s) 16	n=5	Difficult Item(s) 16
	3. Operations	2,6,9,19,23,26, 27,28,30		2,6,9,19,23,26, 27,28,30
Large type n=23		Difficult Item(s) None	n=12	Difficult Item(s) None
Braille n=16		Difficult Item(s) 27	n=5	Difficult Item(s) 9,26

Table 25 continued

Intermediate Battery Level I

Math Concepts

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	4. Geometry and Measurement	7,10,13,14,21,24,29		7,10,13,14,21,24,29
Large type n=23		Difficult Item(s) None	n=12	Difficult Item(s) None
Braille n=16		Difficult Item(s) 10	n=5	Difficult Item(s) 10,13

Table 26

Intermediate Battery Level II

Math Applications

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	1. Selection of an Appropriate Operation	4,5,7,9,10,11,12		4,5,7,9,10,11,12
Large type n=19		Difficult Item(s) None	n=18	Difficult Item(s) None
Braille n=18		Difficult Item(s) 5,9	n=7	Difficult Item(s) 10
	2. Analysis and Development of a Solution Design	6,8,13,16,17,18, 21,23,25,26,32,39		6,13,16,17,18,21, 23,25,26,32
Large type n=19		Difficult Item(s) None	n=18	Difficult Item(s) None
Braille n=18		Difficult Item(s) 8,13,17,23,25	n=7	Difficult Item(s) None
	3. Rate and Scale Problems	1,2,3,19,20,24, 31,33,34,36,37		1,2,3,19,20,24, 31,33,34,36,37,39
Large type n=19		Difficult Item(s) None	n=18	Difficult Item(s) 36
Braille n=18		Difficult Item(s) None	n=7	Difficult Item(s) 2,20

Table 26 continued

Intermediate Battery Level II

Math Applications

	Form A		Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	4. Measurement	22,30,35,38,40		8,22,30,35,38,40
Large type n=19		Difficult Item(s) None	n=18	Difficult Item(s) None
Braille n=18		Difficult Item(s) 35	n=7	Difficult Item(s) 8
	5. Graph Reading and Interpretation	14,15,27,28,29		14,15,27,28,29
Large type n=19		Difficult Item(s) None	n=18	Difficult Item(s) None
Braille n=18		Difficult Item(s) 15	n=7	Difficult Item(s) 15

Table 27

Intermediate Battery Level II

Math Computation

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	1. Knowledge of Primary Facts	1-24		1-24
Large type *n*=19		Difficult Item(s) 15,20	*n*=18	Difficult Item(s) 15
Braille *n*=21		Difficult Item(s) 4,8,15,20,24	*n*=9	Difficult Item(s) 15
	2. Addition and Subtraction Algorithms	26,27,32,33,37,39		26,27,32,33,37,39
Large type *n*=19		Difficult Item(s) None	*n*=18	Difficult Item(s) None
Braille *n*=21		Difficult Item(s) 33	*n*=9	Difficult Item(s) 32,33
	3. Multiplication and Division Algorithms	25,28,29,31,35, 36,38,40,41,43, 44		25,28,29,31,35, 36,38,40,41,43, 44
Large type *n*=19		Difficult Item(s) None	*n*=18	Difficult Item(s) None
Braille *n*=21		Difficult Item(s) 28,31,35,36,38,41	*n*=9	Difficult Item(s) 41

Table 27 continued

Intermediate Battery Level II

Math Computation

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	4. Common Fractions	30,34,42,45		30,34,42,45
Large type *n*=19		Difficult Item(s) 30	*n*=18	Difficult Item(s) None
Braille *n*=21		Difficult Item(s) None	*n*=9	Difficult Item(s) 34

Table 28

Intermediate Battery Level II

Math Concepts

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	1. Number	5,10,12,19,20,24, 33,34		5,10,12,19,20,24, 33,34
Large type n=19		Difficult Item(s) None	n=18	Difficult Item(s) None
Braille n=21		Difficult Item(s) 5,10,19,24	n=9	Difficult Item(s) 10,19,20,24
	2. Notation	1,6,8,9,17,27,31, 35		1,6,8,9,17,27,31, 35
Large type n=19		Difficult Item(s) None	n=18	Difficult Item(s) None
Braille n=21		Difficult Item(s) 6	n=9	Difficult Item(s) 6
	3. Operations	2,7,13,14,18,22, 25		2,7,13,14,18,22, 25
Large type n=19		Difficult Item(s) None	n=18	Difficult Item(s) None
Braille n=21		Difficult Item(s) None	n=9	Difficult Item(s) None

Table 28 continued

Intermediate Battery Level II

Math Concepts

Form A			Form B	
Medium & number of subjects	Item grouping	Item numbers	Number of subjects	Item numbers
	4. Geometry, Measurement, etc.	3,4,11,15,16,21, 23,26,28,29,30,32		3,4,11,15,16,21, 23,26,28,29,30,32
Large type *n*=19		Difficult Item(s) None	*n*=18	Difficult Item(s) None
Braille *n*=21		Difficult Item(s) 3,4,16,21,23,30	*n*=9	Difficult Item(s) 3,4,21

Appendix A

Letter Explaining Project and Questionnaire on Data Availability

American Printing House For The Blind Incorporated

CARSON Y. NOLAN, Ph. D., President
1839 Frankfort Avenue
MAILING ADDRESS: P.O. BOX 6085
Louisville, Kentucky 40206-0085
502 895•2405 TWX 810 535•3449

Date

Dear :

At the American Printing House for the Blind, a project is underway which involves gathering baseline data on the academic achievement of legally blind students. The two major objectives of the project are to relate achievement levels in all areas assessed by the Stanford Achievement Test (SAT) to grade norms and to determine concepts and operations in mathematics where deficiencies exist.

In order to accomplish these objectives, it is necessary for us to gather data from schools where the SATs have been administered and students' scores are still on file. Our records show that you have purchased one or more of the following levels of the SAT in braille or large print:

Primary Battery Level II (grades 2.5-3.4)
Primary Battery Level III (grades 3.5-4.4)
Intermediate Battery Level I (grades 4.5-5.4)
Intermediate Battery Level II (grades 5.5-6.9)

If any of these four levels have been administered to legally blind students who used the regular print version, they also can be included in the study.

Names of the students will in no way be recorded nor will any student time be required. The information needed on each student included birth date, age and grade at time of testing, date of testing, reading medium used by the student while taking the test, and the raw score and grade equivalent obtained on each subtest. Forms have already been prepared for recording this information. The forms are neither lengthy nor difficult to complete. These data will enable us to relate the achievement levels in all areas assessed by the SAT to grade norms.

In order to accomplish the second objective, it will be necessary to have the response records of the students on the three math subtests. Having the complete response records for the math subtests will enable us to do an item analysis to identify the areas in mathematics where young visually handicapped children are having problems. However, if the responses of the students on the math subtests are no longer available to you, but you have the raw scores and grade equivalents for each subtest on the SAT we would be very happy to have that much information from you.

The criteria for students to be included are:

1. that the students were classified as legally blind as shown on ophthalmological reports contained in school records,
2. that students were not administered the test orally, and
3. that students were enrolled in a standard academic curriculum.

The success of this project depends on the cooperation of many persons. Even receiving data on one student is very important. Please complete and return the enclosed form in the self-addressed envelope.

Thank you very much for your time and interest in this project.

Sincerely,

Debbie Willis
Research Associate
Department of Educational Research

DW/dma

Enclosures

Please return this form to:
Debbie Willis
Research Associate
Department of Educational Research
American Printing House for the Blind
1839 Frankfort Avenue
Louisville, Kentucky 40206

Name of contact person: ____________________

Address: ____________________

Telephone No.: (   ) ____________________

Please check Yes or No to the following questions:	Yes	No
Do you have the raw scores and/or grade equivalents for each subtest on the SAT available?	____	____
Do you have the complete response records for the three math subtests available?	____	____
Are you planning on administering the SAT anytime soon? If yes, when? ____________________	____	____
Would you be willing to share whatever information you have with APH?	____	____

Please check one of the following:

____ I would be willing to fill out the forms and return them to you

____ APH staff would have to come to use our records for the information needed in filling out the forms.

____ I would be happy to mail whatever information you need to fill out the forms at APH.

Approximately how many student data forms would be needed for each of the four levels?:

Braille Readers

____ Primary Battery Level II

____ Primary Battery Level III

____ Intermediate Battery Level I

____ Intermediate Battery Level II

Print Readers

____ Primary Battery Level II

____ Primary Battery Level III

____ Intermediate Battery Level I

____ Intermediate Battery Level II

Comments: ____________________

____

____

____

Appendix B

Trustees or Field People

Ordering Materials for State or Area

Ms. Lynn Albright
New Hampshire Department of Education
3 Budd Way
Nashua, New Hampshire 03060

Mrs. Jean Bosh
Missouri Department of Education
3815 Magnolia Avenue
St. Louis, Missouri 63110

Ms. Carol Chandler
HI/VI State Depository
Louisiana State Department of Education
P. O. Box 2074
Baton Rouge, Louisiana 70821

Ms. Martha Valentine or Ms. Susan Cobb
Virginia State Department of Education
c/o Virginia Department for the Visually Handicapped
397 Azalea Avenue
Richmond, Virginia 23227-3697

Mrs. Barbara Gillis
Montana State Department of Education
3911 Central Avenue
Great Falls, Montana 59401

Mr. Ralph Giordano
New York State Department of Education
Instructional Materials for the Handicapped
Education Building Annex
Hawk Street
Albany, New York 12234

Mr. Duane Guestenburger
Iowa Commission for the Blind
Iowa State Department of Public Instruction
4th and Keosauqua Way
Des Moines, Iowa 50309

Ms. Candance Hall
Connecticut State Board of Education
and Services for the Blind
170 Ridge Road
Wethersfield, Connecticut 06109

Mrs. G. S. Hill
State of Maine
Braille Library
Division of Eye Care
Bureau of Rehabilitation
615 Congress--Suite 315
Portland, Maine 04101

Mrs. Rebah Hubbard
Library Media Specialist
Kansas State Department of Education
Wichita Regional Library for Visually
Impaired and Blind
4558 North Hudraulic
Wichita, Kansas 67219

Mrs. Bess D. Kaplan
Materials Coordinator
Arizona State Department of Education
The Foundation for Blind Children
3720 North 75th Street
Scottsdale, Arizona 85251

Mr. Roger Laybourn
Washington Department of Public Instruction
14721 Murray Road, S.W.
Tacoma, Washington 98439

Mr. Paul Lewis
Florida State Department of Education
Florida Instruction Materials Center
for the Visually Handicapped
5002 North Lois Avenue
Tampa, Florida 33614

Ms. Carol McCarroll
Tennessee Department of Education
Materials Library
Educational Media Center
Building 308--11th Avenue
Smyrna, Tennessee 37167

Ms. Jeanne Orszag
Michigan Department of Education
Pine at Maple Street
Lansing, Michigan 48913

Mrs. Ellen Pedigo
Indiana Department of Public Instruction
7725 North College
Indianapolis, Indiana 46240

Mr. Pete Rossi
New Jersey Commission for the Blind
1100 Raymond Boulevard
Newark, New Jersey 07102

Mr. Buck Schrotberger
Colorado Department of Education
Special Education Services
1362 Lincoln Street
Denver, Colorado 80203

Mr. Fred Sinclair
California State Department of Education
Clearinghouse Depository for Handicapped
Students
721 Capitol Mall
Sacramento, California 95814

Mr. David Terry
Illinois State Board of Education
444 West Reynolds Street
Springfield, Illinois 62702

Mrs. Julie Todd
Ohio State Department of Education
5220 North High Street
Columbus, Ohio 43214

Appendix C

Letter to People Ordering Materials for State or Area

American Printing House For The Blind Incorporated

CARSON Y. NOLAN, Ph. D., President
1839 Frankfort Avenue
MAILING ADDRESS: P.O. BOX 6085
Louisville, Kentucky 40206-0085
502 895•2405 TWX 810 535•3449

Date

Dear :

We are conducting a study at the American Printing House for the Blind, the purpose of which is contained in the attached letter. Please read over the attached letter so that you will be familiar with the project.

At the present time, I am trying to get the attached letter and form to those teachers, psychologists, counselors, vision consultants, etc., who have administered the Stanford Achievement Test to legally blind students. In order to be sure that the attached letter goes to the appropriate people, could you either supply me with a list of names and addresses of the persons who have placed orders through you or, if you prefer, I could send you as many copies of the attached letter and form as you request and you could then forward them to the people involved.

Thank you very much.

Sincerely,

Debbie Willis
Research Associate
Department of Educational Research

DW/dma

Enclosure

Appendix D

Data Forms

No. __________

Form A _______

Form B _______

Stanford Achievement Test
____ Large Print Edition
____ Regular Print Edition
Student Record Form

*Primary Battery Level II __________ Intermediate Battery Level I __________

Primary Battery Level III __________ Intermediate Battery Level II __________

Date of Birth: ____________________

Date of Testing: ____________________

Age (at time of testing): ____________________

Grade (at time of testing): ____________________

Reading medium used during test: ____________________

Subtest		Raw Score	Grade Equivalent
1. Vocabulary			
2. Reading Comprehension:	Part A		
	Part B		
	Total		
3. Word Study Skills			
4. Mathematics Concepts			
5. Mathematics Computation			
6. Mathematics Applications			
7. Spelling			
8. Language			
9. Social Science			
10. Science			
11. Listening Comprehension			

*This level excludes the subtest on language.

Stanford Achievement Test
Braille Edition
Student Record Form

No.__________

Form A_______

Form B_______

*Primary Battery Level II__________ Intermediate Battery Level I____________

Primary Battery Level III__________ Intermediate Battery Level II___________

Date of Birth:____

Date of Testing:____

Age (at time of testing):____

Grade (at time of testing):____

Reading medium used during test:____

Subtest		Raw Score	Grade Equivalent
1. Vocabulary			
2. Reading Comprehension:	Part A		
	Part B		
	Total		
3. Word Study Skills			
4. Mathematics Concepts			
5. Mathematics Computation			
6. Mathematics Applications:	Part A		
	Part B		
	Total		
7. Spelling			
8. Language			
9. Social Science			
10. Science			
11. Listening Comprehension			

*This level excludes the subtests on language, social science, and science.

No. ________

Form A ______

Form B ______

Stanford Achievement Test
____ Large Print Edition
____ Regular Print Edition
Student Record Form

Primary Battery Level II

Date of Birth: ____________________

Date of Testing: ____________________

Age (at time of testing): ____________________

Grade (at time of testing): ____________________

Reading medium used during test: ____________________

Mathematics Concepts

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____
11. ____
12. ____
13. ____
14. ____
15. ____
16. ____
17. ____
18. ____
19. ____
20. ____
21. ____
22. ____
23. ____
24. ____
25. ____
26. ____
27. ____
28. ____
29. ____
30. ____
31. ____
32. ____
33. ____
34. ____
35. ____

Mathematics Computation

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____
11. ____
12. ____
13. ____
14. ____
15. ____
16. ____
17. ____
18. ____
19. ____
20. ____
21. ____
22. ____
23. ____
24. ____
25. ____
26. ____
27. ____
28. ____
29. ____
30. ____
31. ____
32. ____
33. ____
34. ____
35. ____
36. ____
37. ____

Mathematics Applications

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____
11. ____
12. ____
13. ____
14. ____
15. ____
16. ____
17. ____
18. ____
19. ____
20. ____
21. ____
22. ____
23. ____
24. ____
25. ____
26. ____
27. ____
28. ____

No.__________

Form A_______

Form B_______

Stanford Achievement Test
Braille Edition
Student Record Form

Primary Battery Level II

Date of Birth:______________________________

Date of Testing:______________________________

Age (at time of testing):______________________________

Grade (at time of testing):______________________________

Reading medium used during test:______________________________

Mathematics Concepts

1. ______ 18. ______
2. ______ 19. ______
3. ______ 20. ______
4. ______ 21. ______
5. ______ 22. ______
6. ______ 23. ______
7. ______ 24. ______
8. ______ 25. ______
9. ______ 26. ______
10. ______ 27. ______
11. ______ 28. ______
12. ______ 29. ______
13. ______ 30. ______
14. ______ 31. ______
15. ______ 32. ______
16. ______ 33. ______
17. ______

Mathematics Computation

1. ______ 20. ______
2. ______ 21. ______
3. ______ 22. ______
4. ______ 23. ______
5. ______ 24. ______
6. ______ 25. ______
7. ______ 26. ______
8. ______ 27. ______
9. ______ 28. ______
10. ______ 29. ______
11. ______ 30. ______
12. ______ 31. ______
13. ______ 32. ______
14. ______ 33. ______
15. ______ 34. ______
16. ______ 35. ______
17. ______ 36. ______
18. ______ 37. ______
19. ______

Mathematics Applications

1. ______ 15. ______
2. ______ 16. ______
3. ______ 17. ______
4. ______ 18. ______
5. ______ 19. ______
6. ______ 20. ______
7. ______ 21. ______
8. ______ 22. ______
9. ______ 23. ______
10. ______ 24. ______
11. ______ 25. ______
12. ______ 26. ______
13. ______ 27. ______
14. ______ 28. ______

No.__________

Form A_______

Form B_______

Stanford Achievement Test
____ Large Print Edition
____ Regular Print Edition
Student Record Form

Primary Battery Level III

Date of Birth:______________________________

Date of Testing:______________________________

Age (at time of testing):______________________________

Grade (at time of testing):______________________________

Reading medium used during test:______________________________

Mathematics Concepts

1. _____ 17. _____
2. _____ 18. _____
3. _____ 19. _____
4. _____ 20. _____
5. _____ 21. _____
6. _____ 22. _____
7. _____ 23. _____
8. _____ 24. _____
9. _____ 25. _____
10. _____ 26. _____
11. _____ 27. _____
12. _____ 28. _____
13. _____ 29. _____
14. _____ 30. _____
15. _____ 31. _____
16. _____ 32. _____

Mathematics Computation

Part A Part B

1. _____ 25. _____
2. _____ 26. _____
3. _____ 27. _____
4. _____ 28. _____
5. _____ 29. _____
6. _____ 30. _____
7. _____ 31. _____
8. _____ 32. _____
9. _____ 33. _____
10. _____ 34. _____
11. _____ 35. _____
12. _____ 36. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____

Mathematics Applications

1. _____ 15. _____
2. _____ 16. _____
3. _____ 17. _____
4. _____ 18. _____
5. _____ 19. _____
6. _____ 20. _____
7. _____ 21. _____
8. _____ 22. _____
9. _____ 23. _____
10. _____ 24. _____
11. _____ 25. _____
12. _____ 26. _____
13. _____ 27. _____
14. _____ 28. _____

No. ______

Form A ______

Form B ______

Stanford Achievement Test
Braille Edition
Student Record Form

Primary Battery Level III

Date of Birth: ______

Date of Testing: ______

Age (at time of testing): ______

Grade (at time of testing): ______

Reading medium used during test: ______

Mathematics Concepts

1. ______
2. ______
3. ______
4. ______
5. ______
6. ______
7. ______
8. ______
9. ______
10. ______
11. ______
12. ______
13. ______
14. ______
15. ______
16. ______
17. ______
18. ______
19. ______
20. ______
21. ______
22. ______
23. ______
24. ______
25. ______
26. ______
27. ______
28. ______
29. ______
30. ______
31. ______
*32. ______

* Form B only

Mathematics Computation

1. ______
2. ______
3. ______
4. ______
5. ______
6. ______
7. ______
8. ______
9. ______
10. ______
11. ______
12. ______
13. ______
14. ______
15. ______
16. ______
17. ______
18. ______
19. ______
20. ______
21. ______
22. ______
23. ______
24. ______
25. ______
26. ______
27. ______
28. ______
29. ______
30. ______
31. ______
32. ______
33. ______
34. ______
35. ______
36. ______

Mathematics Applications

1. ______
2. ______
3. ______
4. ______
5. ______
6. ______
7. ______
8. ______
9. ______
10. ______
11. ______
12. ______
13. ______
14. ______
15. ______
16. ______
17. ______
18. ______
19. ______
20. ______
21. ______
22. ______
23. ______
24. ______
25. ______
26. ______
27. ______
28. ______

No.________

Form A______

Form B______

Stanford Achievement Test
____Large Print Edition
____Regular Print Edition
Student Record Form

Intermediate Battery Level I

Date of Birth:______________________________

Date of Testing:______________________________

Age (at time of testing):______________________________

Grade (at time of testing):______________________________

Reading medium used during test:______________________________

Mathematics Concepts

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____
11. ____
12. ____
13. ____
14. ____
15. ____
16. ____
17. ____
18. ____
19. ____
20. ____
21. ____
22. ____
23. ____
24. ____
25. ____
26. ____
27. ____
28. ____
29. ____
30. ____
31. ____
32. ____

Mathematics Computation

Part A

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____
11. ____
12. ____
13. ____
14. ____
15. ____
16. ____
17. ____
18. ____

Part B

19. ____
20. ____
21. ____
22. ____
23. ____
24. ____
25. ____
26. ____
27. ____
28. ____
29. ____
30. ____
31. ____
32. ____
33. ____
34. ____
35. ____
36. ____
37. ____
38. ____
39. ____
40. ____

Mathematics Applications

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____
11. ____
12. ____
13. ____
14. ____
15. ____
16. ____
17. ____
18. ____
19. ____
20. ____
21. ____
22. ____
23. ____
24. ____
25. ____
26. ____
27. ____
28. ____
29. ____
30. ____
31. ____
32. ____
33. ____
34. ____
35. ____
36. ____
37. ____
38. ____
39. ____
40. ____

No.__________

Stanford Achievement Test
Braille Edition
Student Record Form

Form A_______

Form B_______

Intermediate Battery Level I

Date of Birth:______________________________

Date of Testing:______________________________

Age (at time of testing):______________________________

Grade (at time of testing):______________________________

Reading medium used during test:______________________________

Mathematics Concepts		Mathematics Computation		Mathematics Applications	
				Part A	Part B
1. _____	17. _____	1. _____	21. _____	1. _____	1. _____
2. _____	18. _____	2. _____	22. _____	2. _____	2. _____
3. _____	19. _____	3. _____	23. _____	3. _____	3. _____
4. _____	20. _____	4. _____	24. _____	4. _____	4. _____
5. _____	21. _____	5. _____	25. _____	5. _____	5. _____
6. _____	22. _____	6. _____	26. _____	6. _____	6. _____
7. _____	23. _____	7. _____	27. _____	7. _____	7. _____
8. _____	24. _____	8. _____	28. _____	8. _____	8. _____
9. _____	25. _____	9. _____	29. _____	9. _____	9. _____
10. _____	26. _____	10. _____	30. _____	10. _____	10. _____
11. _____	27. _____	11. _____	31. _____	11. _____	11. _____
12. _____	28. _____	12. _____	32. _____	12. _____	12. _____
13. _____	29. _____	13. _____	33. _____	13. _____	13. _____
14. _____	30. _____	14. _____	34. _____	14. _____	14. _____
15. _____	31. _____	15. _____	35. _____	15. _____	15. _____
16. _____	32. _____	16. _____	36. _____	16. _____	16. _____
		17. _____	37. _____	17. _____	17. _____
		18. _____	38. _____	18. _____	18. _____
		19. _____	39. _____	19. _____	19. _____
		20. _____	40. _____	20. _____	20. _____

No.__________

Form A________

Form B________

Stanford Achievement Test
____Large Print Edition
____Regular Print Edition
Student Record Form

Intermediate Battery Level II

Date of Birth:______________________________

Date of Testing:______________________________

Age (at time of testing):______________________________

Grade (at time of testing):______________________________

Reading medium used during test:______________________________

Mathematics Concepts

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____
25. _____
26. _____
27. _____
28. _____
29. _____
30. _____
31. _____
32. _____
33. _____
34. _____
35. _____

Mathematics Computation

Part A

1. _____
2. _____
3. _____
4. _____
5. _____
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Part B

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Mathematics Applications

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Form A _______

Form B _______

Stanford Achievement Test
Braille Edition
Student Record Form

Intermediate Battery Level II

Date of Birth: ______________________________

Date of Testing: ______________________________

Age (at time of testing): ______________________________

Grade (at time of testing): ______________________________

Reading medium used during test: ______________________________

Mathematics Concepts

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* Form A only

Mathematics Computation

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Mathematics Applications

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